INEEL/EXT-01-01644
Revision 4

Health and Safety Plan for the Long-Term Stewardship Sitewide Groundwater Monitoring

October 2004

Idaho Completion Project

Bechtel BWXT Idaho, LLC

INEEL/EXT-01-01644
Revision 4
Project No. 23037

Health and Safety Plan for the Long-Term Stewardship Sitewide Groundwater Monitoring

October 2004

Idaho Completion Project
Idaho Falls, Idaho 83415

Prepared for the
U.S. Department of Energy
Assistant Secretary for Environmental Management
Under DOE Idaho Operations Office
Contract DE-AC07-99ID13727

Health and Safety Plan for the Long-Term Stewardship Sitewide Groundwater Monitoring

INEEL/EXT-01-01644
Revision 4

Approved by

Dan M. Smith — 10/26/04

Dan M. Smith,
Bechtel BWXT Idaho, LLC
Groundwater Monitoring Lead

Date

Michael P. Hodel — 10-26-04

Michael P. Hodel,
Bechtel BWXT Idaho, LLC
Project Manager Long-Term Stewardship

Date

ABSTRACT

This Health and Safety Plan establishes the requirements and controls that will be used to eliminate or minimize health and safety hazards associated with long-term, sitewide, groundwater-monitoring activities for the Balance of INEEL Cleanup Project.

This Health and Safety Plan has been prepared to meet the requirements of the Occupational Safety and Health Administration standard, 29 *Code of Federal Regulations* 1910.120/1926.65, "Hazardous Waste Operations and Emergency Response." The plan contains the safety and health hazard assessment of all groundwater-monitoring activities and lists controls and actions to take to eliminate or mitigate identified hazards.

The intent of this document is to identify known hazards, based on previously conducted groundwater-monitoring tasks, and provide a plan for mitigating them. Health and safety professionals supporting these tasks in conjunction with the field team leader conducting these activities must determine the most appropriate hazard-control and mitigation measures based on site-specific conditions and, as appropriate, revise this document.

CONTENTS

FIGURES

TABLES

ACRONYMS

ACGIH	American Conference of Governmental Industrial Hygienists
ALARA	as low as reasonably achievable
ANSI	American National Standards Institute
ARDC	Administrative Record and Document Control
BBWI	Bechtel BWXT Idaho, LLC
BIC	Balance of INEEL Cleanup
CAS	Chemical Abstract Service
CERCLA	Comprehensive Environmental, Response, Compensation, and Liability Act
CFA	Central Facilities Area
CFR	*Code of Federal Regulations*
CNS	central nervous system
CO	carbon monoxide
CPR	cardiopulmonary resuscitation
CWA	controlled work area
DAR	Document Action Request
dBA	decibel A-weighted
DMCS	Document Management Control System
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy Idaho Operations Office
DWA	designated work area
EAM	emergency action manager
EC	emergency coordinator
EPA	U.S. Environmental Protection Agency
ERO	Emergency Response Organization
FID	flame ionization detector
FTL	field team leader
GDE	guide

GI	gastrointestinal
HASP	health and safety plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HSO	health and safety officer
IARC	International Agency for Research on Cancer
ICP	Idaho Completion Project
ICS	Incident Command System
IH	industrial hygienist
INEEL	Idaho National Engineering and Environmental Laboratory
IRTL	incident response team leader
ISMS	Integrated Safety Management System
JSA	job safety analysis
LTS	long-term stewardship
MCP	management control procedure
MSDS	material safety data sheet
NFPA	National Fire Protection Association
NIOSH	National Institute of Occupational Safety and Health
NOC	not otherwise classified
NRR	noise reduction rating
NTP	National Toxicology Program
OMP	Occupational Medical Program
OSC	on-scene commander
OSHA	Occupational Safety and Health Administration
PDD	program description document
PE	project engineer
PEL	permissible exposure limit
PID	photoionization detector
PLN	plan
PM	project manager

POC	point of contact
POD	plan of the day
PPE	personal protective equipment
PRD	program requirements document
RadCon	radiological control
RCRA	Resource Conservation and Recovery Act
RCT	radiological control technician
RWP	radiological work permit
SDA	Subsurface Disposal Area
SS	shift supervisor
STD	standard
STEL	short-term exposure limit
TBD	to be determined
TLD	thermoluminescent dosimeter
TLV	threshold-limit value
TPR	technical procedure
TRAIN	Training Records and Information Network
TWA	time-weighted average
VD	vapor density
VOC	volatile organic compound
VPP	Voluntary Protection Program
WAG	waste area group
WBGT	wet bulb globe temperature
WCC	Warning Communications Center
WGS	Waste Generator Services

Health and Safety Plan for the Long-Term Stewardship Sitewide Groundwater Monitoring

1. INTRODUCTION

This Health and Safety Plan (HASP) establishes the requirements and controls that will be used to eliminate or minimize health and safety hazards associated with long-term, sitewide, groundwater-monitoring activities under the Long-Term Stewardship (LTS) Program. These activities are conducted to monitor the quality of groundwater that might originate from areas within the boundaries of the Idaho National Engineering and Environmental Laboratory (INEEL).

This HASP governs all tasks associated with LTS sitewide groundwater monitoring, including well and lysimeter sampling, maintenance, abandonment, and associated subtasks. This HASP also covers the tasks associated with drilling and well installation. Employees of Bechtel BWXT Idaho, LLC (BBWI), BBWI subcontractors, or U.S. Department of Energy (DOE) laboratory personnel will do all tasks. Personnel not normally assigned to work at the INEEL—such as representatives of DOE, the State of Idaho, the Occupational Safety and Health Administration (OSHA), and the U.S. Environmental Protection Agency (EPA)—are not considered field team members and fall under the definition of "occasional site workers" in 29 *Code of Federal Regulations* (CFR) 1910.120/1926.65, "Hazardous Waste Operations and Emergency Response."

This HASP has been prepared to meet the requirements of 29 CFR 1910.120/1926.65, "Hazardous Waste Operations and Emergency Response." Its preparation is consistent with information in the National Institute for Occupational Safety and Health (NIOSH)/OSHA/United States Coast Guard/EPA *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities* (NIOSH 1985), *Manual 14A–Safety and Health–Occupational Safety and Fire Protection, Manual 14B–Safety and Health–Occupational Medical and Industrial Hygiene*, *Manual 15A–Radiological Control Manual,* and *Manual 15B–Radiation Protection Procedures.*

To ensure its effectiveness and suitability throughout the project, this HASP will be reviewed and, as necessary, revised by the project health and safety officer in conjunction with the field team leader (FTL); necessary environmental, safety, and health professionals; and Balance of INEEL Cleanup (BIC) groundwater-monitoring personnel.

1.1 Idaho National Engineering and Environmental Laboratory Site Description

The INEEL (formerly the National Reactor Testing Station) encompasses 2,305 km^2 (890 mi^2) and is located approximately 55 km (34 mi) west of Idaho Falls, Idaho (see Figure 1-1). In 1949, the U.S. Atomic Energy Commission (now the DOE) established the National Reactor Testing Station (now the INEEL) to build and test a variety of nuclear facilities. The INEEL has also stored transuranic radionuclides and radioactive low-level waste since 1952. Now the INEEL supports the engineering and operations efforts of the DOE and other federal agencies in areas of nuclear safety research, reactor development, reactor operations and training, nuclear defense materials production, waste management technology development, and energy technology and conservation programs. The U.S. Department of Energy Idaho Operations Office (DOE-ID) is responsible for the INEEL and designates authority to operate the INEEL to government contractors. The current primary contractor for DOE-ID at the INEEL (i.e., BBWI) manages and operates most INEEL facilities.

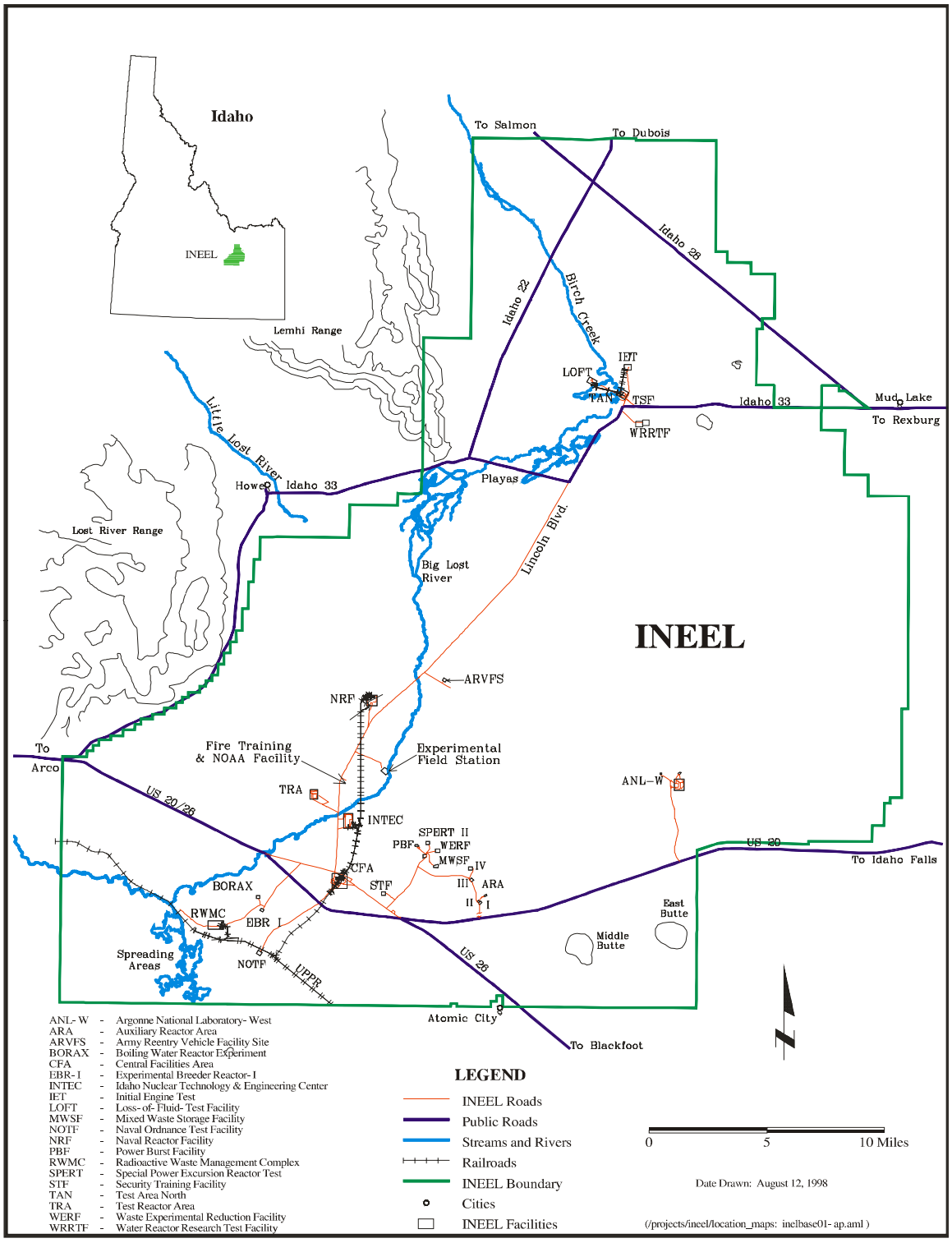

Figure 1-1. Map of the Idaho National Engineering and Environmental Laboratory showing locations of major facilities.

1.2 Project Description

Many of the routine groundwater-monitoring activities across the INEEL are conducted under the LTS Program. These monitoring activities take place within and outside the fence lines of various INEEL facilities, including Test Area North, the Naval Reactors Facility, the Test Reactor Area, the Idaho Nuclear Technology and Engineering Center, the Central Facilities Area (CFA), the Radioactive Waste Management Complex, the Power Burst Facility/Auxiliary Reactor Area, and Argonne National Laboratory-West. Numerous other wells are located or will be installed on the perimeter of the INEEL boundary. Figure 1-2 shows the location of all the aquifer wells at the INEEL and illustrates the extent of this project.

This HASP covers groundwater-monitoring activities for Waste Area Groups (WAGs) 2, 4, 5, 7, and 10. Groundwater-monitoring activities at other WAGs might be added later. Currently, activities at other WAGs are covered by their respective HASPs.

The objectives of this investigation are to monitor and identify any degradation of groundwater quality. These data will (1) aid in the understanding of fate and transport of contaminant migration, (2) help fill previously identified data gaps, and (3) support the selection of appropriate remedial alternatives (as applicable).

1.3 Scope

The scope of this HASP covers the collection, preservation, and shipment of water samples; the operations and maintenance (all components including surface features) of the aquifer water well, perched water well, lysimeter, and tensiometer; moisture infiltration monitoring using a neutron probe; soil gas vapor sampling; abandonment of wells, associated components, and systems; and, where applicable, the installation of additional monitoring wells. These tasks will be accomplished with ICP resources with support from applicable facility personnel. In addition, BBWI subcontract personnel might be used for specific tasks.

1.3.1 Site Preparation

When the task site is outside of a facility boundary, all notifications will be made and equipment will be collected in accordance with Management Control Procedure (MCP) -2725, “Field Work at the INEEL.”

All required documentation—such as technical procedures (TPRs) and job safety analyses (JSAs) that govern the specific site tasks and a controlled copy of this HASP—will be available at the task site. In addition, all sampling and emergency equipment (e.g., radio, fire extinguishers, personal protective equipment [PPE], containers, and sampling accessories) will be assembled at the task site in accordance with Section 11 of this HASP or other applicable procedures. A designated work area will be established in accordance with Section 7 of this HASP.

Equipment might require cleaning before sampling and will be done in accordance with Guide (GDE) -162, “Decontaminating Sample Equipment.” The groundwater-monitoring wells will be accessed (as required) in accordance with MCP-2725, “Field Work at the INEEL.”

Idaho National Engineering and Environmental Laboratory

7.5` Shaded Relief and Aquifer Wells

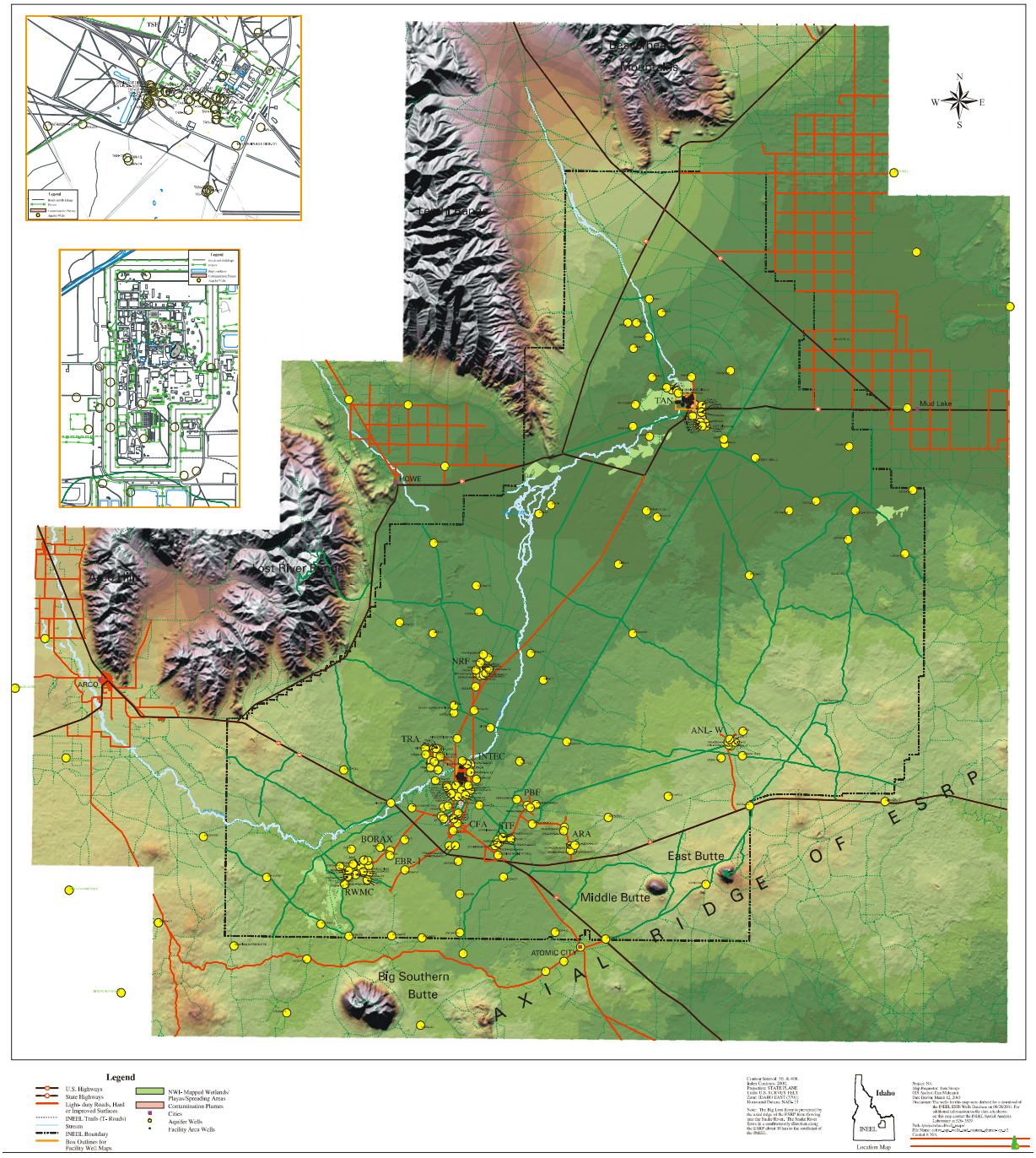

Figure 1-2. Map of the Idaho National Engineering and Environmental Laboratory showing locations of aquifer wells.

1.3.2 Groundwater Monitoring

Groundwater monitoring will take place inside and outside the boundaries of INEEL primary facility areas and may consist of the collection of samples using dedicated and portable pumps, measurement of water levels and water-quality parameters in the field, use of field test kits, containerization and preservation of samples for analysis, and shipment of samples to an on- or off-Site laboratory.

1.3.2.1 Field Measurements. Field measurements will be done in conjunction with sample collection and/or as a separate operation at various well sites. The following paragraphs briefly describe these activities.

1.3.2.1.1 Depth-to-Water—Measurements will be taken before the pump is turned on. No post-sampling, water-level measurement is required.

1.3.2.1.2 Total Well Depth—Occasional well depth verifications might be needed if discrepancies are discovered during sampling events. This is a simple process accomplished by lowering a weighted measuring line into the well until the weight reaches the bottom.

1.3.2.1.3 Tensiometers—Field measurements of installed well tensiometers will be conducted to measure the matric potential (pressure head) of a porous medium under unsaturated conditions or pressure head if saturated conditions form. Matric potential is used to calculate hydraulic gradients, determine the direction of soil water movement in the vadose zone, and calculate the rate of flow, given the hydraulic conductivity of the materials (determined from laboratory analysis of soil samples).

When the tensiometer is placed in unsaturated soil, water in the tensiometer equilibrates with the soil water in the surrounding medium. During equilibration, which could take several days, water will be pulled from the tensiometer, and the pressure head in the tensiometer will change. The pressure transducer will measure the vacuum in the air/water column within the tensiometer, which is in equilibrium with the surrounding medium, to determine the matric potential of the surrounding medium.

A wire lead connects the pressure transducer to a data logger, which stores measurements that can be downloaded periodically. Downloading requires no access to the tensiometer, only the data logger.

1.3.2.2 Well Purging. Purge volumes, which are based on the depth-to-water measurement and the bottom of the well casing, will be calculated.

NOTE: *The depth to the bottom of the well casing will not need to be measured during every sampling event. This value can be carried over from previous measurements.*

For most wells, the purge water may be discharged to the ground. However, purge water from some wells might need to be containerized at the wellhead during sampling events until sampling results or other screening methods demonstrate that it can be discharged to the ground. Purge water will be managed in accordance with the guidance in Plan (PLN) -932, "Management Plan and Implementation of Best Available Technology per DOE Order 5400.5 for Disposal of Wastewater," and MCP-425, "Radiological Release Surveys and the Control and Movement of Contaminated Materials," as applicable. The applicable sampling plan must be followed and facility requirements must be met to ensure that purge water is collected where necessary.

During the purging operation, a Hydrolab or equivalent can be used to measure specific conductance, pH, oxygen reduction potential, dissolved oxygen, and temperature of the purge water. After purging and collection of field measurements, groundwater samples will be collected in accordance with Program Requirements Document (PRD)-5030, "Environmental Requirements for Facilities, Processes, Materials, and Equipment," and MCP-3480, "Environmental Instructions for Facilities, Processes, Materials, and Equipment."

1.3.3 Lysimeter and Perched Water Sampling

The lysimeter is a capped tube with a permeable ceramic cup at the bottom end. Water is drawn from the soil through the ceramic cup and collected. The ceramic cup is manufactured to a certain pore opening size to allow liquid to enter. Lysimeter tasks will include applying a vacuum to the lysimeter to draw water into the cup followed by collection of this water 5 to 14 days later. The water sample is collected by pressurizing the system with an inert gas (generally argon). Then the water is forced to the surface, where it is collected in the sample container.

The depth of perched water will be checked and verified by using an electronic water-level indicator or a similar method. After verification, perched water samples will be collected using a bailer or equivalent method, containerized, preserved (as required), and shipped to an on- or off-Site laboratory in accordance with PRD-5030, "Environmental Requirements for Facilities, Processes, Materials, and Equipment," and MCP-3480, "Environmental Instructions for Facilities, Processes, Materials, and Equipment."

1.3.4 Well, Lysimeter, and Tensiometer Maintenance and Abandonment

Existing wells, lysimeters, and tensiometers require periodic maintenance; they will be abandoned when the location no longer serves a useful purpose. Additional well, lysimeter, or tensiometer operation and maintenance tasks might be required during groundwater monitoring, and the paragraphs that follow are not intended to be all-inclusive, but will describe these activities. These tasks will be done in accordance with existing procedures, procedures generated for specific activities, or a work order written in accordance with Standard (STD) -101, "Integrated Work Control Process."

This HASP might require supplemental revision or additional work control documents (e.g., JSA, work order change) in order to address hazard identification and control of such activities.

1.3.4.1 Well Surface Completion Configuration Maintenance or Replacement. Well surface completion components (such as well heads, pads, posts, labeling, and related surface structures) will require maintenance and replacement in order to keep the well operating. These tasks will be completed by well maintenance personnel with help from specific crafts personnel and subcontractors, based on the nature and complexity of the activity.

1.3.4.2 Internal Well Component Maintenance or Replacement. Internal well components (such as pumps, lines, and tensiometer and lysimeter instruments and components) periodically require maintenance or replacement. These tasks will be completed by well maintenance personnel with help from specific crafts personnel and subcontractors, based on the nature and complexity of the activity.

1.3.4.3 Well Abandonment or Decommissioning Individual Components. Wells that are damaged, are no longer needed based on data acquisition requirements, or have individual components that require decommissioning will be abandoned or decommissioned to meet BIC operational needs and State of Idaho requirements for well abandonment. The specific requirements for abandonment or decommissioning will be described in an appropriate work control document. Current sampling personnel

will complete these tasks with help from specific crafts personnel and subcontractors, based on the nature and complexity of the activity.

1.3.4.4 Well Cleaning. Periodically, wells might need to be cleaned to remove sediment or debris that could hinder the normal operation of the well or its components. Cleaning can be accomplished in a variety of ways including, but not limited to, the following: (1) using compressed air to blow water out of the well, (2) "jetting" water or air into the well under high pressure to blow out existing water and debris, or (3) using a surge block to force water through the well screen and into the casing, then blowing the water out through the top of the well. Some cleaning methods require a certain amount of water in the well to be effective. In some cases, uncontaminated water might need to be added to the well before cleaning.

1.3.5 Well Installation

Some areas might require the installation of additional wells to meet monitoring requirements and data needs. The specific requirements for installing additional wells will be described in an appropriate work control document. Wells will be installed in accordance with State of Idaho requirements. Qualified company or subcontract personnel will perform drilling operations.

2. KEY SITE PERSONNEL RESPONSIBILITIES

The organizational structure for this project reflects the resources and expertise needed to do the work while minimizing risks to worker health and safety, the environment, and the public. Key project positions at the INEEL and within the BIC Program structure are outlined in the following subsections.

2.1 Balance of INEEL Cleanup Project Management

2.1.1 Balance of INEEL Cleanup Project Manager

The BIC project manager (PM) is ultimately responsible for the technical quality of all projects, for maintaining a safe environment, and for the safety and health of all personnel during field activities done by or for the BIC Program. The PM provides technical coordination and interfaces with DOE-ID. The PM ensures the following:

- Project activities are performed in accordance with all federal, state, local, and company requirements and agreements
- Project budgets and schedules are approved and monitored to be within budgetary guidelines
- Personnel, equipment, subcontractors, and services are available for the project
- Direction is provided for the development of tasks, evaluation of findings, development of conclusions and recommendations, and production of reports.

2.1.2 Project Engineer

The project engineer (PE) is responsible for executing the project's technical work. This includes, but is not limited to, the following:

- Supervising engineers to ensure that engineering and design services are timely, cost-effective, comply with project orders and directives, and incorporate sound engineering practices and high technical standards
- Integrating technical resources and schedules, establishing priorities, and identifying and requesting resources needed to accomplish assigned engineering and design activities
- Working with the customer and the PM to establish firm project/task requirements that are clear, concise, and executable
- Developing a project technical execution strategy and ensuring that cost-effective design solutions are developed in accordance with safety, environmental, and quality objectives
- Reviewing project status and variance and providing corrective actions
- Resolving conflicts over project requirements and project team members' comments on design, including defending and selling design positions to the project team and the Agencies
- Coordinating all BIC project designs with the appropriate site area engineering manager.

In addition, the PE is responsible for the project's technical staffing, including being an interface between the PM and the appropriate functional managers of the organizations that provide the technical staff. The PE is accountable to the PM for all cost and schedule performance of the assigned technical tasks and to the functional managers for the technical quality of a project's work products.

2.1.3 Long-Term Stewardship Project Manager

The LTS PM is responsible for developing and managing the LTS Program. The LTS PM ensures the following:

- The LTS Program operations, *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory* (DOE-ID 1991) compliance support, surveillance, and monitoring activities are conducted according to all applicable federal, state, local, and company requirements and agreements
- Following remedial actions, the WAGs are transitioned into the LTS Program for long-term implementation
- Program budgets and schedules are approved and monitored to be within budgetary guidelines
- Direction is provided for the development of LTS tasks, evaluation of findings, development of conclusions and recommendations, and production of reports.

2.1.4 Integrated Groundwater Monitoring Lead

The integrated groundwater monitoring lead is responsible for the scope, schedule, budget, and technical quality of long-term BIC groundwater-monitoring activities. The groundwater monitoring lead is responsible for the technical content and quality of all project deliverables. Additional responsibilities include the following:

- Providing technical oversight, direction, and acceptance of environmental products developed by groundwater project teams
- Ensuring the overall technical quality of project deliverables
- Monitoring and performing groundwater-monitoring field activities in accordance with the established cost and schedule
- Identifying startup requirements of new groundwater-monitoring field activities and completing required management self-assessment(s) or readiness assessment(s).

2.1.5 Environmental Compliance

The assigned BIC environmental compliance coordinator oversees, monitors, and advises the WAG manager or FTL performing site activities on environmental issues and concerns and ensures compliance with DOE orders, EPA regulations, and other regulations concerning the effects of site activities on the environment. The project environmental compliance coordinator provides or arranges for environmental support services for hazardous waste storage, transport, and disposal through Waste Generator Services (WGS).

2.1.6 Quality Engineer

The assigned BIC quality engineer provides guidance on the project quality issues. The quality engineer can periodically observe task site activities and verify that site operations comply with the quality requirements pertaining to those activities. The project quality engineer reviews quality-significant procurement documents to ensure that adequate ordering criteria are specified for materials procured to support the project. Receipt inspection of procured materials is performed by Procurement Quality.

2.1.7 Safety and Health Engineer

The Safety and Health engineer is responsible for the following:

- Preparing the project HASP
- Coordinating portions of the work controls (where needed)
- Overseeing safety and health aspects of the field activities
- Ensuring that project personnel meet all training requirements.

The Safety and Health engineer reports directly to the PM and is accountable for cost and schedule performance of project Safety and Health tasks. The Safety and Health engineer ensures that safety and health requirements are incorporated into documents directing field activities and for safe performance of field activities (as applicable).

2.2 Task Site Responsibilities

2.2.1 Field Team Leader

The FTL represents the BIC organization at groundwater-monitoring sites with delegated responsibility for the safe and successful completion of the project tasks. The FTL will manage groundwater-monitoring operations and execute the applicable field sampling plans, TPRs, and other project-specific documents. Generally, the FTL will also be the sampling FTL for all groundwater-monitoring tasks and can serve as the health and safety officer (HSO), based on his or her qualifications and the complexity of the activities. The FTL enforces site control, documents activities, and conducts (or may delegate to an appropriately trained alternate) the plan-of-the-day (POD) meeting or prejob briefing at the start of the shift. Health and safety issues must be brought to the FTL's attention. The FTL will report project status on a regular basis to the Integrated Groundwater lead. Additional responsibilities include, but are not limited to, the following:

- Ensuring that all groundwater-monitoring field activities comply with the Integrated Safety Management System (ISMS) requirements and associated work orders or procedures
- Ensuring that field team personnel comply with facility and operations requirements
- Obtaining and coordinating all resources needed to implement the groundwater-monitoring fieldwork, including equipment, labor, and administrative and technical permits and approvals
- Coordinating with the applicable WAG or facility interface to schedule groundwater-monitoring tasks during the facility POD meeting, as necessary

- Ensuring that notations, comments, records, and the field logbook are completed
- Directing subcontract personnel supporting the groundwater-monitoring tasks at the project sites.

If the FTL leaves the site, an alternate individual will be appointed, and the name of the alternate will be communicated to all field personnel. Persons acting as FTL must meet all the FTL training requirements outlined in Section 4.

2.2.2 Sampling Team

The sampling team will consist of the FTL and support personnel and is responsible for collecting, preserving, and shipping groundwater-monitoring samples in accordance with the applicable field sampling plan and TPRs. The industrial hygienist (IH), radiological control technician (RCT), and safety professional will support the sampling team (as required), based on site-specific hazards and task evolutions. The sampling team will be led by a sampling FTL, who can also perform other roles during the project.

2.2.3 Specialty Subcontractors

Specialty subcontractors can be used to support certain groundwater-monitoring maintenance, repair, well installation, and abandonment tasks. A subcontractor lead will be the single point of contact (POC) for all subcontractor safety issues at the site and will report to the FTL for all technical direction and interface issues at the project site. Subcontractor personnel will report any health and safety issues that arise to the FTL or HSO and can stop work if conditions are unsafe. The subcontractor lead will also be asked to provide hazard and mitigation information about the nature of the subcontractor's equipment or operations during the POD meeting and can participate in job-site hazard walk-downs, when appropriate.

2.2.4 Field Team Members

All groundwater-monitoring field team members, including facility and subcontractor personnel assigned to operational support roles, will understand and comply with the requirements of this HASP. The FTL (or designee) will conduct a formal prejob briefing or POD meeting at the start of each shift. All daily tasks, associated hazards, hazard mitigation (i.e., engineering and administrative controls, required PPE, and work control documents), and emergency conditions and actions will be discussed during the POD briefing. Input from the project HSO, IH, and safety personnel (where assigned) will be provided to clarify task health and safety requirements, as deemed appropriate. All project personnel are encouraged to ask questions about site tasks and suggest ways to do required tasks in a safer, more effective manner.

Once at the groundwater-monitoring project site, personnel are responsible for reporting unsafe conditions to the FTL or HSO for corrective action.

NOTE: *If it is perceived that an unsafe condition poses an imminent danger, site personnel are authorized to* ***STOP WORK immediately*** *and notify the FTL or HSO of the unsafe condition.*

2.2.5 Non-field Team Members

Persons at a groundwater-monitoring site during operations who are not part of the field team (e.g., surveyor or others not assigned in an operational support role) are considered non-field team

members, as defined by this HASP. A person will be considered "onsite" when he or she is in the designated work area boundary (described in detail in Section 7).

Non-field team members are considered occasional site workers in accordance with 29 CFR 1910.120/1926.65, "Hazardous Waste Operations and Emergency Response," and must receive site-specific HASP training before entering the project site's designated work area. In addition, they must meet all training requirements for the area of the site they need to access, based on the groundwater-monitoring activity taking place. A site supervisor (e.g., HSO or FTL) will also supervise non-field team personnel who have not completed their supervised field experience in accordance with 29 CFR 1910.120/1926.65, "Hazardous Waste Operations and Emergency Response."

2.2.6 Visitors

Visitors to a groundwater-monitoring project site (including BBWI personnel, representatives of DOE, and state or federal regulatory agencies) can only proceed into the designated work area during operational activities if they are on official business and do the following:

- Receive site-specific HASP training or a hazard briefing, based on specific tasks taking place
- Sign a HASP training roster and provide proof of meeting all training requirements specified in Section 4 (or required access training for the area to be visited when groundwater-monitoring tasks are not being conducted)
- Sign applicable JSA training rosters for the particular operation or area(s) to be accessed
- Provide objective evidence of PPE training and wear the appropriate PPE for the area of the site accessed.

A fully trained task-site representative (e.g., FTL or HSO [or a designated alternate]) will escort visitors when entering the project site's designated work area, as site conditions warrant and as deemed appropriate by the FTL.

NOTE: *Visitors will not be allowed into controlled work areas during certain maintenance tasks (e.g., hoisting and rigging of well pumps) in order to minimize risks to visitors. The determination as to any visitor's "need" for access to the controlled work area will be made by the FTL in consultation with the HSO and safety professional (as appropriate).*

A casual visitor to the task site is a person who has no specific task or other official business at the project site. **Casual visitors are not permitted on any project site.**

2.2.7 Health and Safety Officer

The HSO is the person assigned to the task site who is the primary contact for all health and safety issues. The HSO advises the FTL on all aspects of health and safety and is authorized to stop work at the task site if any operation threatens worker or public health or safety. The HSO is authorized to verify compliance with the HASP, conduct inspections and self-assessments, require and monitor corrective actions, and monitor decontamination procedures (as appropriate). Support professionals at the task site (i.e., safety professional, IH, RCT, environmental coordinator, and facility representative) support the HSO, as necessary.

Persons assigned as the HSO or the HSO alternate must be qualified to recognize and evaluate hazards and have the authority to take or direct actions to ensure that workers are protected. Other HSO task site responsibilities must not interfere with the HSO's primary role at the task site, even though the HSO may also be the IH, the safety professional, or, in some cases, the FTL (depending on the hazards and complexity of the activity involved). If the HSO must leave the site, the HSO will appoint an alternate individual to fulfill this role, and his or her identity will be communicated to project personnel.

2.2.8 Industrial Hygienist

The assigned IH is the primary source for information regarding exposure assessments for groundwater monitoring chemical, physical, and biological hazards at the project site. The IH assesses the potential for worker exposures to hazardous agents according to INEEL safety and health manuals (i.e., *Manual 14A–Safety and Health–Occupational Safety and Fire Protection* and *Manual 14B–Safety and Health–Occupational Medical and Industrial Hygiene*), MCPs, and accepted industry industrial hygiene practices and protocol. By participating in project planning, the IH assesses and recommends appropriate hazard controls for the protection of site personnel, operates and maintains airborne sampling and monitoring equipment, reviews for effectiveness, and recommends and assesses the use of PPE required in this HASP (recommending changes as appropriate).

The IH, supervisor, or HSO will refer personnel showing health effects (i.e., signs and symptoms) resulting from possible exposure to hazardous agents to an Occupational Medical Program (OMP) physician. The IH may have other duties at the site, as specified in other sections of this HASP or in PRDs or MCPs.

2.2.9 Safety Professional

The assigned INEEL safety professional reviews work packages, observes site activity, assesses compliance with the INEEL safety and health manuals, advises the FTL on required safety equipment, and recommends solutions to safety issues and concerns that arise at the task site. The safety professional may conduct periodic inspections in accordance with MCP-3449, "Safety and Health Inspections," and may have other duties at the task site, as specified in other sections of this HASP or in PRDs and MCPs. Copies of any safety and health inspections will be kept in the field file.

2.2.10 Fire Protection Engineer

The assigned fire protection engineer reviews the work packages, conducts preoperational and operational fire hazard assessments, and provides technical guidance to project personnel regarding all fire protection issues. The INEEL Fire Department also might need to be advised of fuel storage areas (if required) and will provide authorization for all hot work operations performed at the project site during times of high-to-extreme fire danger.

2.2.11 Waste Area Group Facility Interface

The WAG facility interface is the POC for coordination with site area management, as appropriate. The WAG facility interface provides advance notice to the facility management of scheduled activities (including documents requiring review or approvals) that affect site area operations and of site area operations that impact BIC project activities. The WAG facility interface is responsible for the following:

- Coordinating all activities with the appropriate facilities' maintenance and operations managers
- Interfacing with the facility landlord regarding office space

- Consulting with the PM, PE, and FTL on field-labor staffing and facility support.

2.3 Facility Support Staff

2.3.1 Facility Project Manager

The facility PM and staff are responsible for the following functions and processes in their area:

- Ensuring that all work packages performed in the facility area are done properly
- Establishing and executing a monthly, weekly, and daily operating plan for the facility area
- Executing the Safety, Health, and Quality Assurance Program for the facility area
- Executing the ISMS and Voluntary Protection Program (VPP) for the facility area
- Executing that portion of the Voluntary Consent Order that pertains to the facility area
- Correcting the root cause of any accident in the facility area
- Correcting the root causes of the Voluntary Consent Order for the facility area
- Authorizing startup, or a restart, of activities within their area of jurisdiction.

2.3.2 Radiological Engineer

The radiological engineer is the primary source of information and guidance on evaluating and controlling radioactive hazards at the project. The radiological engineer will provide engineering design criteria, review containment structures, and make recommendations to minimize health and safety risks to project personnel. The radiological engineer will estimate radiation exposure and provide as low as reasonably achievable (ALARA) evaluations, identify the type(s) of radiological monitoring equipment necessary for the work, advise the FTL and RCT on changes in monitoring or PPE, and advise personnel on project evacuation and reentry. The radiological engineer can also have other duties, as specified in other sections of this HASP or *Manual 15B–Radiation Protection Procedures*.

2.3.3 Radiological Control Technician

The assigned RCT is the primary source of information and guidance on radiological hazards and will be available during operations that require RCT coverage. The RCT's responsibilities include doing radiological surveys of the project, equipment, and samples; providing guidance for radioactive decontamination of equipment and personnel; and accompanying radiologically contaminated personnel to the nearest INEEL medical facility for evaluation. The RCT must notify the FTL and HSO of radiological occurrences as directed by *Manual 15B–Radiation Protection Procedures*. The RCT can also have other duties at the project, as specified in other sections of this HASP or in INEEL MCPs or PRDs.

3. RECORDKEEPING REQUIREMENTS

3.1 Industrial Hygiene and Radiological Monitoring Records

When IH support is required, the IH will record airborne monitoring and sampling data (both area and personal) collected for exposure assessments in the INEEL Hazards Assessment and Sampling System. All monitoring and sampling equipment will be maintained and calibrated according to INEEL procedures and the manufacturer's specifications. Industrial hygiene airborne monitoring and sampling exposure assessment data are treated as limited access information and maintained by the IH according to the requirements in *Manual 14B–Safety and Health–Occupational Medical and Industrial Hygiene*. Any airborne monitoring or sampling done by non-industrial hygiene/safety personnel will be documented in a project-controlled logbook to be reviewed by the IH.

When RCT support is required, the RCT will maintain a logbook of radiological monitoring, daily project operational activities, and instrument source checks and calibrations. Radiological monitoring records are maintained in accordance with the requirements in *Manual 15B–Radiation Protection Procedures*.

Project personnel, or their representative(s), have a right to access IH and RCT monitoring and sampling data (area and personal). Results from monitoring data also will be communicated to all field personnel, as deemed appropriate, during daily POD meetings and formal prejob briefings.

3.2 Field Team Leader and Sampling Logbooks

The FTL will keep a record of daily task-site events in the FTL logbook. The FTL also will ensure that a logbook of all sampling activities and samples collected is maintained. Any member of the sampling crew can maintain the sample logbook. All logbooks must be obtained from Administrative Record and Document Control (ARDC). Completed sample logbooks must be submitted to the Sampling and Analysis Management Program within 6 weeks of project completion. Logbooks will be maintained in accordance with the requirements of MCP-1194, "Logbook Practices for ER and D&D&D Projects."

3.3 Site Attendance Record

The site attendance record will be used to keep a record of all personnel (i.e., field team members and non-field team members) onsite each day and to help the area warden account for personnel if the site must be evacuated (see Section 11 for emergency evacuation conditions). For projects with few personnel involved, the FTL logbook can be used to record site attendance. On larger projects, a separate attendance logbook can be used, as deemed appropriate by the FTL. The FTL is responsible for maintaining the site attendance record and ensuring that all personnel on the project site sign in.

3.4 Administrative Record and Document Control

The ARDC will organize and maintain data and reports generated as a result of BIC field activities. The ARDC maintains a supply of all controlled documents and provides a documented system for the control and release of controlled documents, reports, and records. The ARDC maintains copies of BIC management plans, this HASP, the *Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10, and Deactivation, Decontamination, and Decommissioning* (DOE-ID 2004), and other documents pertaining to this work.

4. PERSONNEL TRAINING

The INEEL personnel at project sites covered by this HASP will receive training specified in 29 CFR 1910.120/1926.65, "Hazardous Waste Operations and Emergency Response"; *Manual 14A–Safety and Fire Protection–Occupational Safety and Fire Protection*; *Manual 14B–Safety and Health–Occupational Medical and Industrial Hygiene*; *Manual 12–Training and Qualification*; and any applicable facility-specific training. Table 4-1 summarizes the project-specific training requirements for personnel. Specific requirements for personnel requiring access to the project sites might vary depending on the hazards associated with individual job assignments and required access to established controlled work areas. Table 4-1 lists only project-specific training and does not include all potential facility or other general company training required for personnel.

Additions to or elimination of training requirements listed in Table 4-1 might be necessary based on changing field conditions. The HSO—with concurrence from the FTL, PM, RCT, and IH (as applicable)—must approve changes to the requirements listed in Table 4-1. These changes should be based on site-specific conditions and generally will be considered a minor change to the HASP—as defined by instruction on Form 412.11, "Document Management Control System (DMCS) Document Action Request (DAR)"—since the changes will be administrative in nature.

4.1 General Training

All project personnel are responsible for meeting required training, including applicable refresher training. Evidence of training will be maintained at the site or will be available electronically (e.g., Training Records and Information Network [TRAIN]). Before being allowed into project areas, non-field team personnel and visitors must be able to provide evidence of meeting required training for the area they wish to access.

Examples of acceptable written training documents include a 40-Hour OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) card, a respirator authorization card, a medic/first aid training card, or a copy of an individual's or department's (INEEL only) TRAIN system printout demonstrating completion of training. Upon validation, a copy of the training certificate issued by an approved non-INEEL training vendor or institution is also acceptable proof of training. As a minimum, all personnel who access groundwater-monitoring locations are required to wear PPE and must provide objective evidence of having completed INEEL computer-based PPE training (00TRN288) or equivalent, in accordance with 29 CFR 1910, Subpart I, "Personal Protective Equipment." See Section 9 of this HASP for details on PPE requirements.

4.2 Project-Specific Training

The HSO (or designee) will conduct project-specific HASP training before work at groundwater-monitoring project sites begins. This training will consist of a complete review of a controlled copy of the project HASP and attachments, applicable JSAs (if required), work orders, and other applicable work control and authorization documents with time for discussion and questions. Project-specific training can be conducted in conjunction with, or separate from, the required formal prejob briefing (MCP-3003, "Performing Pre-Job Briefings and Documenting Feedback").

Table 4-1. Required training for site personnel.

Training	FTL, HSO, and Samplers	Other Field Team Members	Access into the Designated or Controlled Work Area	Access to Areas Outside Designated or Controlled Work Area
40-hr HAZWOPER[a] - Operations	Yes	[b]	[b]	
24-hr HAZWOPER[a] - Operations		[b]	[b]	
8-hr HAZWOPER site supervisor	Yes			
Project-specific HASP training[c]	Yes	Yes	Yes	
Project-site orientation briefing[d]				Yes
Facility access training (where applicable)	Yes	Yes	[e]	[e]
Fire extinguisher training (or equivalent)	[f]	[f]		
CPR, medic/first aid	[f]	[f]		
Respirator training (contingency only)	[g]	[g]	[g]	
DOE Radiological Worker I/II	[h]	[h]	[h]	
Site access training (blue or orange card)	Yes	Yes	Yes	Yes

Note: Shaded fields indicate specific training is not required/applicable.

a. Includes 8-hr HAZWOPER refresher training, as applicable, and supervised field experience as follows—40-hr HAZWOPER requires 24-hr supervised field experience; 24-hr HAZWOPER requires 8-hr supervised field experience.

b. The HSO will determine the 40- or 24-hr HAZWOPER training requirement based on the nature of the groundwater-monitoring tasks and potential for exposure to contaminants or safety hazards.

c. Includes project-specific hazardous communications, site access and security, and decontamination and emergency response actions, as required by 29 CFR 1910.120(e), "Training."

d. Orientation includes briefing of site hazards, designated work areas, emergency response actions, and PPE requirements. Personnel receiving the project-site orientation briefing only are limited to the areas outside designated work areas and must be escorted by a fully HASP-trained project supervisor or designee.

e. Required for unescorted access in some areas or may be escorted.

f. At least one trained person must be onsite when the field team is working; the HSO will determine the appropriate number of personnel requiring training.

g. Only required if entering area requiring respiratory protection (e.g., action levels exceeded, IH sampling shows respirators required).

h. As required based on project duties and site zone access requirements.

CFR = *Code of Federal Regulations*
CPR = cardiopulmonary resuscitation
DOE = U.S. Department of Energy
FTL = field team leader
HASP = health and safety plan
HAZWOPER = Hazardous Waste Operations and Emergency Response
HSO = health and safety officer
IH = industrial hygienist
PPE = personal protective equipment

At the time of project-specific HASP training, personnel training records will be checked and verified to be current and complete for all the training requirements shown in Table 4-1. Once the HSO (or designee) has completed site-specific training, personnel will sign Form 361.25, "Group Read & Sign Training Roster," or equivalent, indicating that they have received this training, understand the project tasks and associated hazards and mitigations, and agree to follow all HASP and other applicable work control and safety requirements. Form 361.47, "Hazardous Waste Operations (HazWoper) Supervised Field Experience Verification," or equivalent, is available on the INEEL Intranet under "Forms."

A trained HAZWOPER 8-hr supervisor (FTL or other HAZWOPER supervisor-trained person) will monitor each newly 24- or 40-hr trained worker's performance to meet the 1 or 3 days of supervised field experience, respectively, in accordance with 29 CFR 1910.120(e), "Training." After the supervised field experience period, the supervisor will complete Form 361.47, "Hazardous Waste Operations (HazWoper) Supervised Field Experience Verification," or equivalent, to document the supervised field experience.

NOTE 1: *Supervised field experience is only required if personnel have not previously completed this training at another Comprehensive Environmental, Response, Compensation, and Liability Act (CERCLA) site (documented) or if they are upgrading from 24- to 40-hr HAZWOPER training. A copy must be kept at the project site as evidence of training or be available electronically.*

NOTE 2: *Completed training project forms (Form 361.47 or equivalent) must be submitted to the BIC training coordinator for inclusion in the TRAIN system within 5 working days of completion.*

4.3 Daily Plan-of-the-Day Briefing and Lessons Learned

The FTL (or designee) will conduct a daily POD meeting for all personnel entering the task site(s). During this meeting, daily tasks will be outlined; hazards identified; hazard controls, mitigation, and work zones established; PPE requirements discussed; and employees' questions answered. At the completion of this meeting, any new work control documents will be read and signed (e.g., radiological work permits [RWPs] and JSAs).

Particular emphasis will be placed on lessons learned from the previous day's activities and how tasks can be completed in the safest, most efficient manner. All personnel will be asked to contribute ideas to enhance worker safety and potential exposures at the project sites. The POD will be an informal meeting, and the only required record will be to document the completion of the POD in the FTL logbook.

5. OCCUPATIONAL MEDICAL SURVEILLANCE PROGRAM

Task site personnel will participate in the INEEL OMP, as required by 29 CFR 1910.120/1926.65, "Hazardous Waste Operations and Emergency Response." Medical surveillance examinations will be provided before assignment, annually, and after termination of HAZWOPER duties or employment (as required). These examinations will include:

- Personnel who are, or might be, exposed to hazardous substances at or above the OSHA permissible exposure limit (PEL) or published exposure limits, without regard to respirator use for 30 or more days per year
- Personnel who are injured, become ill, or develop signs or symptoms due to possible overexposure to hazardous substances
- Personnel who wear a respirator for 30 days or more a year or as required by 29 CFR 1910.134, "Respiratory Protection."

Personnel who wear a respirator while doing their job, or are required to take respirator training to do their work under this plan, must participate in the medical evaluation program for respirator use at least annually, as required by 29 CFR 1910.134, "Respiratory Protection."

A single copy of the groundwater-monitoring project HASP, job hazard analysis requirements, required PPE, confined space entry (as applicable), and other exposure-related information will be made available (upon request) to the OMP physician and subcontractor physicians conducting medical surveillance for employees participating in this project. Exposure monitoring results and hazard information furnished to the OMP physician must be supplemented or updated annually as long as the employee is required to maintain a hazardous waste/material employee medical clearance.

The OMP physician will evaluate an employee's physical ability to do the work assigned, as identified in the site HASP or other job-related documentation. A documented medical clearance (e.g., physician's written opinion) will be provided to the employee and line management stating whether the employee has any medical condition that would place him or her at increased risk of health impairment from working in hazardous waste operations, emergency response operations, respirator use areas, and confined spaces (as applicable). The physician can impose restrictions on the employee by limiting the amount and type of work performed.

5.1 Subcontractor Workers

As required, subcontractor project personnel will participate in a subcontractor medical surveillance program that satisfies the requirements of 29 CFR 1910.120/1926.65, "Hazardous Waste Operations and Emergency Response." This program must make medical examinations available before assignment, annually, and after termination of hazardous waste duties. The physician's written opinion (as defined by 29 CFR 1910.120(f)(7), "Physician's Written Opinion," or equivalent) will serve as documentation that subcontractor personnel are fit for duty.

Medical data from the subcontractor employee's private physician, collected pursuant to hazardous material worker qualification, will be made available to the INEEL OMP physicians upon request. In addition, the subcontractor employee's past radiation exposure history must be submitted to the INEEL radiation dosimetry and records section in accordance with *Manual 15B–Radiation Protection Procedures;* MCP-188, "Issuing TLDs and Obtaining Personnel Dose History"; and MCP-2381, "Personnel Exposure Questionnaire."

5.2 Injuries on the Site

According to INEEL policy, an OMP physician must examine all injured personnel if (1) an employee is injured on the job, (2) an employee is experiencing signs and symptoms consistent with exposure to a hazardous material, or (3) there is reason to believe that an employee has been exposed to toxic substances or physical or radiological agents in excess of allowable limits.

NOTE: *In the event of an injury, subcontractor employees will be taken to the closest INEEL medical facility to have an injury stabilized before transport to the subcontractor's treating physician or medical facility.*

Employees who are injured or become ill because of known or suspected exposure to a hazardous substance or physical or radiological agent will be transported to the nearest INEEL medical facility for evaluation and treatment (as necessary). The HSO is responsible for obtaining as much of the following information as possible and accompanying the individual to the medical facility:

- Name, job title, work (site) location, and supervisor's name and phone number
- Substance, physical agent, or radiological agent exposed to (known or suspected) and material safety data sheet (MSDS), if available
- Nature of the incident/injury or exposure and related signs or symptoms of exposure
- First aid or other measures taken
- Locations, dates, and results of any airborne exposure monitoring or sampling
- PPE in use during this work (e.g., type of respirator and cartridge used).

The treating or examining physician will evaluate injured or ill workers in accordance with the signs and symptoms observed, hazard involved, exposure level, and specific medical surveillance requirements established by the OMP director in compliance with 29 CFR 1910.120/1926.65, "Hazardous Waste Operations and Emergency Response."

As soon as possible after an injured individual has been transported to the INEEL medical facility, the FTL or designee will notify additional project personnel identified in Section 11 of this HASP.

5.3 Substance-Specific Medical Surveillance

Extensive sampling and analysis data exist for water samples collected from wells located across the INEEL. Only trace amounts of radionuclide and chemical contaminants have been detected in water samples; concentrations are considered to be below those that would yield airborne fractions approaching health-based occupational exposure values, e.g., OSHA PELs or American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit values (TLVs) (ACGIH 2004). Therefore, substance-specific medical surveillance is not anticipated for site workers. If new contaminants of concern are identified during the course of groundwater-monitoring tasks, exposures will be evaluated and quantified to determine if a substance-specific standard applies. If regulatory-mandated substance-specific standard action levels are triggered, then affected personnel will be enrolled in applicable medical surveillance programs.

6. ACCIDENT PREVENTION PROGRAM

The primary hazards presented by groundwater-monitoring activities are physical in nature. To a lesser extent, the potential for chemical hazards exists. In addition to well sampling tasks, however, the scope of groundwater-monitoring work includes more complex and hazardous tasks—such as well installation, maintenance, and decommissioning—that require more detailed planning and hazard-mitigation strategies. It is important that all personnel participating in groundwater-monitoring activities understand and follow the project-specific HASP, JSA, hazard mitigation and PPE requirements, applicable work package(s) steps, and hold points (where applicable) to control hazards.

Hazards and personnel exposures will be eliminated or mitigated through the use of engineering controls, hazard isolation, work practices and training, and PPE. However, all groundwater-monitoring personnel have responsibilities in the hazard-identification and control process. These include the following:

- Participate in the hazard-identification process based on the scope of work.
- Participate in the hazard walk-downs of the areas where groundwater-monitoring activities will take place.
- Help complete hazard screening checklists or hazard profile screening checklists (as applicable).
- Attend the prejob briefing and subsequent POD meetings to ensure that all workers have a clear understanding of the scope of work, associated hazards, and mitigation requirements.

NOTE: *Ask the FTL for clarification* ***before signing the prejob attendance sheet and before starting work*** *if the scope of work, hazards identified, hazard mitigation (including PPE requirements), or work control documentation are not clearly understood.*

- Recognize changing conditions, scope of work, and new hazards requiring mitigation, and take the appropriate action to communicate these conditions to the FTL.
- Halt activities or stop work (where appropriate in accordance with MCP-553, "Stop Work Authority") until new scope or hazards are adequately addressed in work control documents and mitigation is in place.

All field team members must participate in the hazard identification and mitigation process for an accident-prevention program to be effective. This process will be ongoing during the course of groundwater-monitoring activities and as additional tasks (scopes of work) are initiated. Feedback to the FTL and communication between workers regarding groundwater-monitoring lessons learned are critical for ensuring safety and efficiency. The daily POD and post-job briefing provide a formal forum for sharing lessons learned and contributing ideas for safer and more efficient ways to do work. However, new ideas and lessons learned should be shared before work is conducted to be most effective.

6.1 Voluntary Protection Program and Integrated Safety Management

As part of operational excellence, the INEEL safety processes embrace the VPP and ISMS criteria, principles, and concepts. All levels of management are responsible for implementing safety policies and programs and for maintaining a safe and healthy work environment. Project personnel and subcontractors

are expected to take a role in preventing accidents, ensuring safe working conditions for themselves and fellow personnel, and complying with all work control documents and procedures.

The ISMS is focused on the **system** side of conducting operations, and VPP concentrates on the **people** side of conducting work; however, both define work scope and identify, analyze, and mitigate hazards. The VPP is a process that promotes and encourages continuous safety improvement, but VPP is not a requirement of any regulatory agency. The INEEL and affected subcontractors participate in VPP and integrated safety management for the safety of their employees. Additional information on VPP and ISMS can be found in Program Description Document (PDD) -1005, "INEEL Line Management and Operations Manual." The five key elements of VPP and ISMS are as follows:

VPP	ISMS
Management leadership	Define work scope
Employee involvement	Analyze hazards
Work site analysis	Develop and implement controls
Hazard prevention and control	Perform work within controls
Safety and health training	Provide feedback and improvement

6.2 General Safe-Work Practices

The following practices are mandatory for all INEEL and subcontractor personnel working at BIC long-term, groundwater-monitoring sites. Visitors entering designated or controlled work areas also must follow these practices. The FTL and HSO are responsible for ensuring that these hazard-control practices are followed at the site.

NOTE: *Failure to follow these practices can result in permanent removal from the site and other disciplinary actions.*

- Access to designated or controlled work areas will be limited to authorized BBWI personnel, subcontractor personnel, and visitors.
- Do not enter controlled work areas or areas posted with DANGER signs unless authorized to do so by the FTL.
- Comply with all safety signs, color codes, and barriers. Do not cross safety or radiological barriers unless you understand the hazard within and have the proper training to access the area. Adhere to PRD-5117, "Accident Prevention Signs, Tags, Barriers, and Color Codes."
- Obtain, ensure the operability of, and carry the following equipment in accordance with MCP-2725, "Field Work at the INEEL," when doing fieldwork:
  - INEEL pager
  - Two-way communications (mobile phone or INEEL radio)
  - Fire extinguisher or shovel
  - First aid kit that complies with MCP-2559, "Use of First Aid Kits"
  - Hunter orange safety vest or hat (August 1 through December 31).

- Do not eat, drink, chew gum or tobacco, smoke, apply cosmetics, or do anything else that increases the probability of hand-to-mouth transfer and ingestion of materials, except in designated eating or break areas.

- Wear all prescribed PPE (minimum of Level D), and comply with the requirements in PRD-5121, "Personal Protective Equipment."

- Be aware of walking and working surface conditions (wet, snow/mud/frost/ice-covered), apply sand or salt where appropriate, and wear adequate footwear to prevent slips and falls.

- Do not wear finger rings, loose clothing, wristwatches, and other loose accessories when within arm's reach of moving machinery.

- Report unsafe equipment, defective or frayed electrical cords, and unguarded machinery to the FTL or HSO.

- Use provided ground-fault protection whenever electrical equipment is used outdoors.

- Ensure that electrical equipment, wiring, cables, switches, and current overload protection devices meet applicable regulations and are maintained in a manner that protects personnel from shock hazards and prevents property damage in accordance with the requirements of MCP-3650, "Chapter IX–Level I Lockouts and Tagouts"; MCP-3651, "Chapter IX–Level II Lockouts and Tagouts"; and any facility-specific supplements.

- Keep all ignition sources at least 15 m (50 ft) from explosive or flammable environments, and use nonsparking, explosion-proof equipment (if advised to do so by a safety professional).

- Be alert for dangerous situations, strong or irritating odors, or airborne dusts or vapors. Report all dangerous situations to the FTL.

- Check weather forecasts and be alert to changing weather conditions that could present hazards to personnel (e.g., lightning, high winds, winter storms).

- Be familiar with, understand, and follow project emergency procedures (see Section 11).

- Be familiar with the physical characteristics of the task site, including, but not limited to, the following:

    - Wind direction

    - Accessibility of fellow personnel, equipment, and vehicles

    - Communications at the task site

    - Major roads and means of access to and from the site

    - Nearest water sources and fire-fighting equipment

    - All area and project warning devices and alarms

    - Capabilities and location of nearest incident response team and INEEL Fire Department.

- Prevent releases of hazardous materials, including those used at the task site. If a spill occurs, try to isolate the source (if possible and if doing so does not create a greater exposure potential), and then report the spill to the FTL. Report accidental releases of hazardous materials to applicable facility personnel, as stated in Section 11 of this HASP. Appropriate spill response kits or other confinement and absorbent materials will be maintained at the task site.

- Report all broken skin or open wounds to the HSO or FTL. The OMP physician will determine the method for bandaging the wound and recommend PPE to be worn by the injured employee.

NOTE: *Personnel with wounds that are not bandaged properly will not be permitted to enter the controlled work area.*

- Personnel working in the controlled work area will implement the "buddy system" (see Section 6.5).

- When appropriate, initiate **STOP WORK** actions in accordance with MCP-553, "Stop Work Authority."

6.3 As Low as Reasonably Achievable Principles

Groundwater-monitoring data from existing wells, lysimeters, and purge water have demonstrated that radiological contamination from groundwater at these sites presents only a minimal radiological exposure hazard (external or contamination). Consequently, ALARA principles will be followed when the potential exists for contact with water with trace radionuclide contaminants.

Radiological monitoring will be conducted at specific locations based on previous groundwater radionuclide sampling data and on the potential for encountering contamination during monitoring, maintenance, and decommissioning tasks, as specified in TPRs and as deemed appropriate by Radiological Control (RadCon) personnel. If contamination is detected at levels that alert personnel to changing conditions (e.g., above background or RWP limits, if written), personnel will isolate potentially contaminated equipment or surfaces and halt activities until adequate controls can be implemented.

Radiation must be controlled such that personnel exposures to it are well below regulatory limits and no radiation exposure occurs without commensurate benefit. Unplanned and preventable exposures are unacceptable. The goal is to eliminate or minimize radiation exposures, and all project personnel are responsible for following ALARA principles and practices. Personnel working at the site will strive to keep external and internal radiation doses ALARA by adopting the practices described in the following subsections.

6.3.1 External Radiation Dose Reduction

Basic protective measures used to reduce external doses of radiation include the following:

- Minimizing time in radiation areas

- Maximizing the distance from known sources of radiation

- Using radiation protection shielding.

Personnel will adhere to all radiological postings at the site, wear required dosimetry, and contact an RCT if contamination is suspected of being encountered during any groundwater-monitoring task. An

RWP may be written for specific groundwater-monitoring maintenance, decommissioning, or abandonment operations—as deemed appropriate by RadCon personnel and in accordance with MCP-7, "Radiological Work Permit."

6.3.2 Internal Radiation Dose Reduction

An internal dose of radiation is a result of radioactive material being taken into the body. Radioactive material can enter the body through inhalation, ingestion, absorption through wounds, or injection from a puncture wound. Reducing the potential for radioactive material to enter the body is critical to avoiding internal doses of radiation. Contamination will be monitored using hand-held instruments in accordance with MCP-357, "Job-Specific Air Sampling/Monitoring"; as deemed appropriate by RadCon personnel; and as specified in applicable RWPs.

6.4 Chemical Contaminant Exposure Avoidance

Groundwater-monitoring data from existing wells, lysimeters, and purge water have demonstrated that chemical contaminant levels are low. Based on the water matrix these contaminants are in and the minimal exposure time for personnel conducting sampling and handling tasks, the potential for approaching health-based exposure limits (i.e., PELs or TLVs) is considered minimal to negligible.

Other sources of chemical exposure include the following:

- Acids used to preserve water samples
- Fuels used for generators and powered equipment
- Bentonite, cement, and concrete used during well or borehole abandonment and installation tasks
- Small amounts of petroleum-based lubricants that might be used during maintenance tasks.

Some of these contaminants could pose a hazard from skin, mucous membrane, or eye contact; implementation of avoidance practices in conjunction with PPE use minimizes the potential for exposures. Some methods of exposure avoidance include the following:

- Isolating known sources of contamination through the use of engineering controls or barriers
- Using a laboratory hood for acid-handling and sample-preservation tasks
- Wearing all required PPE, inspecting all pieces before donning, and taping all seams
- Donning and doffing PPE following radiological protocols if additional outer protective clothing is required
- Washing hands, face, and other exposed body surfaces before eating, drinking, smoking, or participating in other activities that could provide a pathway for contaminants.

6.5 The Buddy System

The two-person or "buddy" system will be used at groundwater-monitoring sites when a controlled work area has been established. The buddy system requires workers to assess and monitor their "buddy's"

mental and physical well-being during the course of the workday. A "buddy" must be able to do the following:

- Provide assistance
- Verify the integrity of PPE (when required)
- Observe his or her partner for signs and symptoms of heat stress, cold stress, or contaminant exposure
- Notify other personnel in the controlled work area if emergency assistance is needed.

Workers must be able to see or hear, and effectively communicate with, their "buddy" at all times when in the controlled work area.

7. SITE CONTROL AND SECURITY

Site control and security will be maintained at BIC long-term, sitewide, groundwater-monitoring locations during operational activities to prevent unauthorized personnel from entering the work area. Entry into and exit from these areas will be controlled through the appropriate use of barriers, signs, and other measures in accordance with PRD-5117, "Accident Prevention Signs, Tags, Barriers, and Color Codes."

Based on the nature of the groundwater-monitoring tasks to be completed, a graded approach with two types of site control designations (work areas) will be used to meet HAZWOPER site control requirements. These work areas will be based on the potential hazards, complexity of work tasks, duration of project tasks, and location and number of non-project personnel near the project area. The two types of work areas are:

- Designated work areas (DWAs) (established for low-hazard routine monitoring and maintenance tasks)

- Controlled work areas (CWAs) (established for higher-hazard maintenance, installation, decommissioning, and abandonment tasks).

The primary differences between the types of work areas will be the size of the area, method of delineation, and postings, which are determined by the operations being conducted and associated hazards. The HSO, in conjunction with the FTL and RadCon personnel (where radiological concerns exist), will determine the type of work area to be established.

Personnel not directly involved with groundwater-monitoring activities will be excluded from entering these work areas. Visitors can be admitted into work areas if they are (1) on official business, (2) authorized by the FTL, and (3) have met all the site-specific training requirements for the area they will be accessing, as listed on Table 4-1.

NOTE: *Visitors will not be allowed into CWAs during certain maintenance, installation, decommissioning, or abandonment tasks to minimize risks to workers and visitors. The FTL—in consultation with the HSO, RadCon personnel, the IH, and Safety personnel (as appropriate)—will make the determination as to any visitor's need for access into the controlled work area.*

Figures 7-1 and 7-2 illustrate a DWA and CWA, respectively. These figures represent the general configuration of the work areas; they are not intended to provide an exact layout, position of equipment, or scale. Changing field conditions and industrial hygiene or RadCon monitoring could warrant reconfiguration of the layout, size, designation, and orientation of these work areas. In addition, entrance and egress points could change based on these same factors. Changes to areas will be the decision of the FTL in conjunction with the HSO, RadCon (as appropriate), safety professional, and IH based on monitoring data and the nature of the activities taking place.

All safety, chemical, and radiological hazards will be evaluated when delineating each work area location and size. Barriers (e.g., rope, cones, and printed ribbon) will be used for delineation and demarcation. When warranted, designated traffic routes also might be established. These areas will be posted to prevent inadvertent entry by unauthorized personnel.

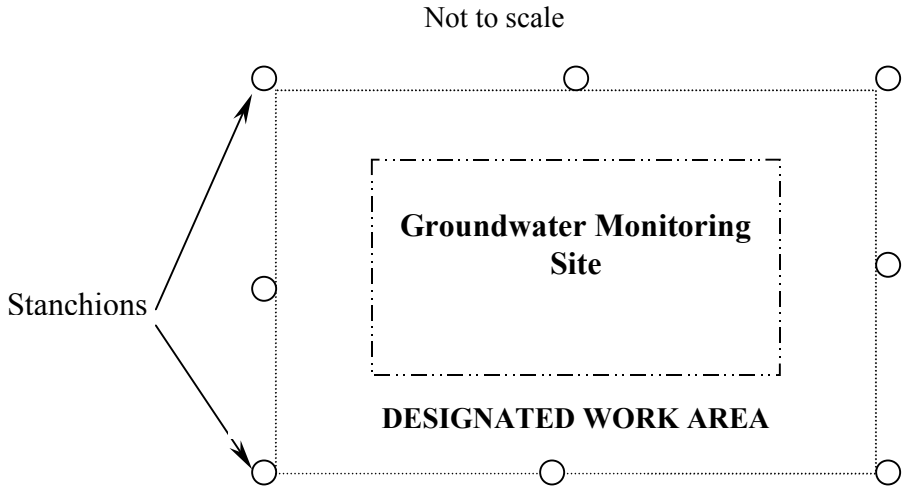

Figure 7-1. Example configuration for a groundwater-monitoring designated work area.

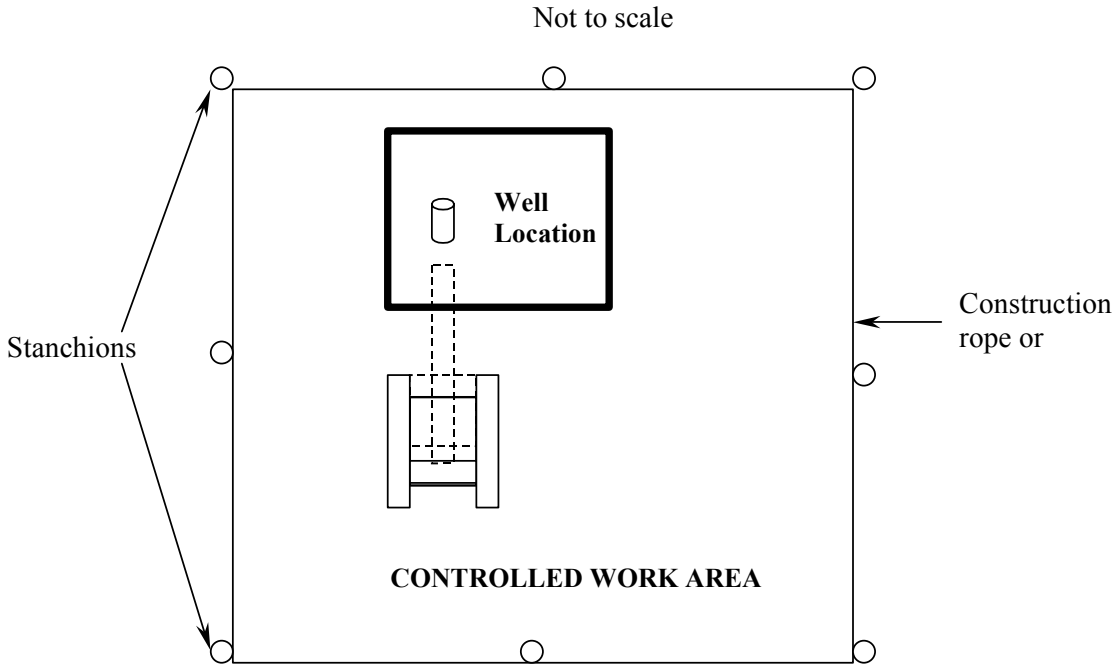

Figure 7-2. Example configuration for a groundwater-monitoring controlled work area.

NOTE: *The safety professional and IH will help the HSO establish the access requirements for the truck traffic routes, the DWAs, and the project-based equipment in use.*

7.1 Designated Work Area

The DWAs established for groundwater-monitoring tasks will consist of the area immediately around the well being monitored and an area large enough to encompass associated field-measurement and sampling equipment. This type of work area will be established where a more restrictive designated work area would not lend itself to low-hazard, routine, groundwater monitoring or measurement or to short-duration maintenance tasks. Typically, the DWA boundary will be marked with cones or stanchions and generally will not be delineated with rope or ribbon or include other demarcation. All personnel who

enter the DWA will wear the appropriate level of PPE for the degree and type of hazards present, as listed in Section 9.

Generally, support elements (e.g., project administrative trailer, vehicle parking, additional emergency equipment, extra PPE, and stored monitoring and sampling equipment) will be located outside the DWA. Visitors who do not have appropriate training to access the DWA will be restricted from entering this area during groundwater-monitoring operations.

7.2 Controlled Work Area

The CWAs will be large enough to encompass the equipment and nature of the tasks being conducted to prevent personnel not assigned to the project task and visitors from being exposed to safety and health hazards associated with the groundwater-monitoring tasks. This type of work area will be established when a more restrictive area is required based on increased hazards associated with groundwater-monitoring maintenance, installation, decommissioning, or abandonment tasks. Typically, the boundary of the CWA will be marked with a combination of stanchions or posts and delineated with rope or ribbon and will include warning signs (e.g., construction area) or other demarcation. Only the minimum number of personnel required to do the project tasks safely will be allowed into the CWA. The CWA is controlled during all groundwater-monitoring operations, and an entry and exit point will be established at the periphery of the CWA to regulate the flow of personnel and equipment. All personnel who enter the CWA will wear the appropriate level of PPE for the degree and type of hazards present, as listed in Section 9.

Factors that will be considered when establishing the CWA boundary include (1) air monitoring data, (2) equipment in use, and (3) the physical area necessary to conduct site operations. The boundary can be expanded or contracted, as this information becomes available, based on the aforementioned evaluations. The HSO, in conjunction with the safety professional and IH, will establish the CWAs. All CWAs will be delineated and posted with the appropriate signage based on the hazard(s) being controlled.

7.3 Truck Traffic Routes

If required based on project activities, truck traffic routes will be established for trucks entering the CWA. These routes will include a turnaround area (where feasible) and can be delineated with cones or equivalent markers if an existing roadway does not exist. All drivers will be instructed to use these traffic routes when entering and leaving the CWA; workers will be restricted from entering this area when trucks or equipment are traveling on these routes.

7.4 Site Security

All BIC long-term, groundwater-monitoring project sites will be secured and controlled during operational times, as described in previous sections. During off-hours and weekends, locations inside a facility are controlled by the normal facility access requirements. Generally, locations outside a facility will not have to be secured during nonoperational times unless the site is left in a configuration that continues to be worked (CWA with heavy equipment left in the area, well components exposed, etc.). Under these circumstances, CWA rope boundaries and posting will be left in place during off-hours and weekends to prevent personnel from inadvertently entering the CWA.

The FTL has the primary responsibility for ensuring that the CWA is secured. The HSO and RadCon (when required) will ensure that all health and safety and radiological postings for the area are intact when leaving the site and will be responsible for maintaining them for the duration of the project.

Personnel are taught site access and control requirements during project-specific HASP training and will not cross roped areas without the proper training and authorization, regardless of whether a sign is in place or not.

NOTE: *Signs are routinely lost because of high winds and will be replaced as soon as possible the next working day after discovery.*

7.5 Designated Eating and Smoking Areas

Workers who do not use good hygiene at the project sites could ingest hazardous substances. Each worker should wash his or her hands, face, and other exposed skin thoroughly after completing work and before smoking, eating, drinking, and chewing gum or tobacco. The designated eating/smoking areas for the project personnel will be the INEEL-established eating/smoking areas. Personnel must comply with all INEEL smoking policies, including disposing of smoking materials in the proper receptacle. The project safety professional will be the single point of contact for establishing any smoking area outside a facility; such areas might not be used at certain times of the year due to high or extreme fire danger. **Smoking, chewing, eating, applying lip balm/cosmetics, and drinking are not allowed within the site work areas.**

8. HAZARD ASSESSMENT

The overall objectives of this section are to provide guidance on the following:

- Evaluating all groundwater-monitoring tasks to determine the extent that radiological, chemical, and physical hazards might impact site personnel by all routes of entry
- Establishing the necessary personnel and area monitoring required to evaluate exposure, determine adequate action levels to mitigate exposures, and provide specific actions to be followed if action levels are reached
- Determining engineering controls, isolation methods, work practices, administrative controls, and appropriate respiratory protection and protective clothing to protect site personnel from hazards.

8.1 Long-Term Sitewide Groundwater-Monitoring Activities

Personnel will be exposed to potential physical hazards and limited chemical and radiological hazards while conducting groundwater-monitoring tasks. The magnitude of these hazards is related to the specific nature of the tasks being conducted and relative location of the worker to the potential hazard. In general, well-installation, maintenance, decommissioning, and abandonment activities will present greater hazards to personnel than routine groundwater sampling tasks. Engineering controls will be implemented whenever possible along with work-practice controls, TPRs and work orders, real-time monitoring, administrative controls, and site-specific hazard training to further identify and mitigate exposures and hazards. Specific hazards related to groundwater-monitoring activities that are considered operational activities will be identified and mitigated in accordance with MCP-3562, "Hazard Identification Analysis and Control of Operational Activities." Hazards during groundwater-monitoring activities that are related to maintenance or construction will be identified and mitigated in accordance with STD-101, "Integrated Work Control Process." The work control documents (JSAs, TPRs, work orders) arising from MCP-3562 or STD-101 review will augment this HASP and further detail regarding specialized protective equipment and mitigation measures for each groundwater-monitoring task.

Several tables are presented to identify the potential chemical and radiological concentrations based on past monitoring; physical hazards that might be encountered—as well as monitoring methods, action limits, and other hazard-specific mitigation measures—also are addressed:

- Table 8-1 presents an evaluation of chemicals that might be used or encountered during groundwater-monitoring tasks with respect to potential routes of exposure, symptoms of overexposure, and the qualitative exposure risk potential based on the chemical nature of these materials and project tasks

NOTE: *Not all chemicals listed in Table 8-1 apply to all wells in all locations, nor is this table all-inclusive.*

- Table 8-2 summarizes primary groundwater-monitoring tasks, associated hazards, and mitigation
- Table 8-3 lists the hazards that might be monitored by Industrial Hygiene personnel during groundwater-monitoring activities
- Table 8-4 lists industrial hygiene equipment available for monitoring chemical hazards
- Table 8-5 presents action levels and associated responses for specific hazards.

Table 8-1. Evaluation of chemicals and radiological exposures.

Hazardous Material (CAS #)	Exposure Limit[a] (PEL/TLV)	Routes of Exposure[b]	Symptoms of Overexposure[c] (Acute and Chronic)	Target Organs and Systems	Carcinogen (Source)	Exposure Potential (Regardless of Personal Protective Equipment)
Project Chemicals or Compounds Brought to Site						
Bentonite (sodium bentonite)[d] (7631-86-9)	10 mg/m^3 (inert nuisance dust)	Ih, Con	Mucous membrane and respiratory tract irritation	Lungs	No	Moderate Potential Used for well installation and completion.
Silica, crystalline—quartz (cement)[d] (14808-60-7)	TLV—0.05 mg/m^3 (respirable fraction) OSHA PEL (respirable) TWA 10 mg/m^3/ (%SiO_2 + 2) Quartz (total dust): TWA 30 mg/m^3/ (%SiO_2 + 2)	Ih, Con	Pulmonary fibrosis, silicosis	Respiratory	ACGIH A2	Moderate Potential Used for well installation and completion.
Nitric acid[d] (7697-37-2) VD—2 to 3 Ionization energy—11.95 eV	ACGIH TLV—2 ppm STEL—4 ppm OSHA PEL-TWA—2 ppm	Ih, Ig, Con	Irritation of the eyes, skin, mucous membrane; delayed pulmonary edema; pneumonitis; bronchitis; dental erosion	Eyes, skin, respiratory system, teeth	No	Low Potential Used for water sample preservation. Pipettes will be used to deliver acid to the sample container.
Sulfuric acid[d] (7664-93-9)	ACGIH TLV— 1 mg/m^3 STEL— 3 mg/m^3 OSHA PEL-TWA 1 mg/m^3	Ih, Ig, Con	Irritation of the eyes, skin, nose, throat; pulmonary edema; bronchitis; emphysema; conjunctivitis; stomatis; dental erosion; eye, skin burns; dermatitis	Eyes, skin, respiratory system, teeth	ACGIH A2 (as mist)	Low Potential Used for water sample preservation. Pipettes will be used to deliver acid to the sample container.

Table 8-1. (continued).

Hazardous Material (CAS #)	Exposure Limit[a] (PEL/TLV)	Routes of Exposure[b]	Symptoms of Overexposure[c] (Acute and Chronic)	Target Organs and Systems	Carcinogen (Source)	Exposure Potential (Regardless of Personal Protective Equipment)
CO (carbon monoxide) (630-08-0) Portable gasoline- or diesel-powered equipment	TLV—25 ppm OSHA TWA—50 ppm	Ih	Headache; tachypnea; nausea; lassitude (weakness, exhaustion); dizziness; confusion; hallucinations; cyanosis; depressed S-T segment of electrocardiogram; angina; syncope	Cardiovascular system, lungs, blood, CNS	No	Low Potential Equipment will be operated outdoors.
Diesel exhaust	TLV—0.05 mg/m^3 (particulate aerodynamic diameter <1 μm) (ACGIH 2000 notice of intended changes)	Ih	Respiratory irritation of the nose, throat, or lungs with stinging and redness of the eyes, headache, nausea, dizziness, unconsciousness	Respiratory system	ACGIH A2	Low Potential Equipment will be operated outdoors.
Diesel fuel[d] (8008-20-6) VD—>1	TLV—100 mg/m^3 (ACGIH 2000 notice of intended changes)	Ih, S, Con	Eye irritation, respiratory system changes, dermatitis	Eye, respiratory system	No	Low–Moderate Potential Will be used to refuel equipment.
NO_x (nitrogen oxides) (incomplete combustion by-product)—portable equipment operating	TLV—3 ppm (NO_2) STEL—5 ppm OSHA C—5 ppm (NO_2)	Ih	Irritation of the eyes, nose, throat; cough; mucoid frothy sputum; decreased pulmonary function; chronic bronchitis; dyspnea (breathing difficulty); chest pain; pulmonary edema; cyanosis; tachypnea; tachycardia	Eye, respiratory system, cardiovascular system	No	Low Potential Equipment will be operated outdoors.

Table 8-1. (continued).

Hazardous Material (CAS #)	Exposure Limit[a] (PEL/TLV)	Routes of Exposure[b]	Symptoms of Overexposure[c] (Acute and Chronic)	Target Organs and Systems	Carcinogen (Source)	Exposure Potential (Regardless of Personal Protective Equipment)
			Groundwater/Soil Cutting Contaminants			
Zinc (1314-13-2)	PEL—5 mg/m^3 (oxide fume) TLV—5 mg/m^3 (oxide fume)	Ih	Metal fume fever, chills, muscle ache, nausea, dry throat, cough, weakness, headache, blurred vision, lower back pain, vomiting, difficulty breathing	Respiratory system	No	Low Potential Trace source term in groundwater samples and soil cuttings
Manganese (7439-96-5)	OSHA ceiling— 5 mg/m^3 TLV—0.2 mg/m^3	Ih, Ig	Parkinson's, insomnia, confusion, metal fume fever, dry throat, cough, difficulty breathing, low-back pain, vomiting, kidney damage	Respiratory system, CNS, blood, kidneys	No	Low Potential Trace source term in groundwater samples and soil cuttings
Lead (7439-92-1)	PEL—0.05 mg/m^3 TLV—0.05 mg/m^3	Ih, Ig, Con	Weakness, insomnia, facial pallor, weight loss, abdominal pain, anemia, wrist and ankle paralysis, kidney disease, eye irritation	Eyes, GI tract, CNS, kidneys, blood, gingival tissue	Yes—IARC Yes—NTP	Low Potential Trace source term in groundwater samples and soil cuttings
Chromium[e] (7440-47-3)	OSHA ceiling— 0.1 mg/m^3 TLV—0.01 mg/m^3	Ih, Ig, Con	Respiratory, liver, and kidney damage; nasal septum perforation; eye injury; skin ulcer; blood problems, dermatitis	Blood, respiratory system, liver, kidneys, eyes, skin	A1— ACGIH	Low Potential Trace source term in groundwater samples and soil cuttings
Beryllium (7440-41-7)	OSHA TWA—0.002 mg/m^3 OSHA ceiling— 0.005 mg/m^3 TLV—0.002 mg/m^3 SENSITIZER STEL—0.01 mg/m^3	Ih, S, Con	Anorexia, weight loss, exhaustion, chest pain, cough, eye irritation, dermatitis, pulmonary insufficiency	Eyes, skin, respiratory system	A1— ACGIH	Low Potential Trace source term in groundwater samples and soil cuttings

Table 8-1. (continued).

Hazardous Material (CAS #)	Exposure Limit[a] (PEL/TLV)	Routes of Exposure[b]	Symptoms of Overexposure[c] (Acute and Chronic)	Target Organs and Systems	Carcinogen (Source)	Exposure Potential (Regardless of Personal Protective Equipment)
Arsenic (7440-38-2)	PEL—0.01 mg/m^3 TLV—0.01 mg/m^3	Ih, Ig, S, Con	Respiratory damage, nasal ulceration, gastrointestinal disturbances, dermatitis	Liver, kidneys, skin, lungs, lymphatic system	A1—ACGIH	Low Potential Trace source term in groundwater samples and soil cuttings
Cadmium (7440-43-9) VD—NA	TLV—0.01 mg/m^3 inhalable fraction TLV—0.002 mg/m^3 respirable fraction PEL—0.005 mg/m^3 (29 CFR 1910.1027)	Ih, Ig	Respiratory, nervous system, irritation of mucous membranes, dryness of mouth, headache	Kidneys and respiratory tract, blood, prostate	A2—ACGIH Yes—NTP Yes—IARC Yes—OSHA	Low Potential Trace source term in groundwater samples and soil cuttings
Mercury (7439-93-2) VD—1.01	TLV—0.025 mg/m^3	S, Ih	Coughing, chest pain, respiratory distress, salivation, diarrhea, depression, irritability	Skin, eyes, respiratory system, CNS, kidneys	No	Low Potential Trace source term might be encountered in groundwater and soil cuttings.
Thallium (7440-28-0)	TLV—0.1 mg/m^3	Ih, S, Ig, Con	Nausea, diarrhea, abdominal pain, vomiting; ptosis, strabismus; peripheral neuropathy, tremor; retrosternal tight, chest pain, pulmonary edema; seizure, chorea, psychosis; liver, kidney damage; alopecia; paresthesia legs	Eyes, respiratory system, CNS, liver, kidneys, gastrointestinal tract, gocy hair	No	Low Potential Trace source term might be encountered in groundwater and soil cuttings.
Cobalt (7440-48-4)	TLV—0.02 mg/m^3	Ih, Ig, Con	Cough, dyspnea, wheezing, decreased pulmonary functional low weight; dermatitis; diffuse nodular fibrosis; respiratory hypersensitivity, asthma	Skin, respiratory system	No	Low Potential Trace source term might be encountered in groundwater and soil cuttings.

Table 8-1. (continued).

Hazardous Material (CAS #)	Exposure Limit[a] (PEL/TLV)	Routes of Exposure[b]	Symptoms of Overexposure[c] (Acute and Chronic)	Target Organs and Systems	Carcinogen (Source)	Exposure Potential (Regardless of Personal Protective Equipment)
Carbon tetrachloride (56-23-5) Soil VD—5.3 Ionization energy—11.5 eV	TLV—5 ppm STEL—10 ppm OSHA ceiling—63 ppm	Ih, Ig, S, Con	Nervous system, eyes, respiratory: irritation of eyes and skin; CNS, depression, headache	CNS, eyes, liver, lungs, kidneys	A2—ACGIH Yes—NTP Yes—IARC No—OSHA	Moderate--High Potential Source is widely distributed in pits at SDA and has probably migrated from drums.
Methane (74-82-8)	Simple asphyxiant	Ih	"Inert" gas that acts primarily as a simple asphyxiant without other significant physiologic effects when present in high concentrations in air	Displaces oxygen so oxygen does not make it to the lungs	No	Low Potential Soil gas associated with the monitoring wells at the CFA landfills
Methylene chloride (75-09-2) Soil VD—2.9 Ionization energy—11.3 eV	TLV—50 ppm STEL—100 ppm TWA-PEL—25 ppm	Ih, Ig, Con	Headaches, dizziness, skin irritation	Skin, central nervous system, eyes, cardiovascular system	No	Moderate Potential Source is distributed throughout pits at the SDA.
1,2-Dichloroethene (cis and trans) (156-59-2; 156-60-5)	PEL—200 ppm TLV—200 ppm	Ih, Ig, Con	Respiratory, eye irritation, CNS depression	Eyes, respiratory system, CNS	No	Low Potential Trace source term in groundwater samples and soil cuttings
1,1,1-Trichloroethane (71-55-6) VD—4.6 Ionization energy—11.1 eV	TLV—350 ppm STEL—450 ppm Ceiling—2,460 ppm	Ih, Ig, S, Con	Nervous system, dermis, respiratory, eyes, CNS depression, and headache	CNS, skin, eyes, cardiovascular system	No	Low Potential Trace source term in groundwater samples and soil cuttings
Vinylidene chloride (1,1-dichloroethylene) (75-35-4)	TLV—5 ppm	Ih, Con	Eye, skin, and throat irritation; dizziness, headache, nausea, dyspnea; liver and kidney dysfunction; pneumonitis	Eyes, skin, respiratory system, CNS, liver, kidneys	No	Low Potential Trace source term in groundwater samples and soil cuttings

Table 8-1. (continued).

Hazardous Material (CAS #)	Exposure Limit[a] (PEL/TLV)	Routes of Exposure[b]	Symptoms of Overexposure[c] (Acute and Chronic)	Target Organs and Systems	Carcinogen (Source)	Exposure Potential (Regardless of Personal Protective Equipment)
1,1-Dichloroethane (75-34-3)	TLV—100 ppm	Ih, Ig, Con	Irritation of the skin; CNS depression; liver, kidney, lung damage	Skin, liver, kidneys, lungs, CNS	No	Low Potential Trace source term in groundwater samples and soil cuttings
Trichloroethylene (71-55-6) Soil VD—4.53 Ionization energy—9.5 eV	TLV—50 ppm STEL—100 ppm Ceiling—537 ppm	Ih, Ig, Con	Nervous system, headache, respiratory, eyes, pulmonary edema	Respiratory, heart, liver, kidneys, CNS	No	Moderate Potential Source is widely distributed in pits at the SDA; might have migrated from drums.
Trichlorofluoromethane (75-69-4)	PEL—1,000 ppm ACGIH ceiling—1,000 ppm	Ih, Ig, Con	Lack of coordination, tremor; dermatitis; cardiac arrhythmias, cardiac arrest; asphyxia	Skin, respiratory system, cardiovascular system	No	Low Potential Trace source term in groundwater samples and soil cuttings
Radionuclides—Gross Alpha, Gross Beta, Tritium (*Radiological Control Manual* requirements)						
Radionuclides (whole body exposure)	INEEL—1.5 rem/ year project ALARA dose limit, in accordance with the *Radiological Control Manual* or ALARA task Posting of radiation areas in accordance with the *Radiological Control Manual*, Table 2-3	Whole body		Blood-forming cells, GI tract, rapidly dividing cells	Yes	Low–Negligible Potential Trace source term in groundwater samples

Table 8-1. (continued).

Hazardous Material (CAS #)	Exposure Limit[a] (PEL/TLV)	Routes of Exposure[b]	Symptoms of Overexposure[c] (Acute and Chronic)	Target Organs and Systems	Carcinogen (Source)	Exposure Potential (Regardless of Personal Protective Equipment)
Radionuclides (fixed and removable surface contamination)	Posting of contamination areas in accordance with the *Radiological Control Manual*, Table 2-4, Sections 835.404.c and 835.603.f	Ig, Con		GI tract, ionization of internal tissue	Yes	Low Potential Trace source term in groundwater samples

a. *Threshold Limit Values Booklet* (ACGIH 2004) and OSHA 29 CFR 1910 substance-specific standards
b. Ig = ingestion, Ih = inhalation, S = skin absorption, Con = eye or skin contact
c. Nervous system: dizziness, nausea, and lightheadedness. Dermis: rashes, itching, and redness. Respiratory: respiratory effects. Eyes: tearing and irritation.
d. The MSDSs for these chemicals are available at the project site.
e. Exposure limits vary by valence state; the most conservative limits are listed.

ACGIH = American Conference of Governmental Industrial Hygienists
ALARA = as low as reasonably achievable
CAS = Chemical Abstract Service
CFA = Central Facilities Area
CFR = *Code of Federal Regulations*
CNS = central nervous system
GI = gastrointestinal
IARC = International Agency for Research on Cancer
INEEL = Idaho National Engineering and Environmental Laboratory
MSDS = material safety data sheet
NTP = National Toxicology Program
OSHA = Occupational Safety and Health Administration
PEL = permissible exposure limit
PRD = program requirements document
SDA = Subsurface Disposal Area
STEL = short-term exposure limit
TLV = threshold-limit value
TWA = time-weighted average
VD = vapor density

Table 8-2. Groundwater-monitoring tasks, associated hazards, and mitigation.

Tasks	Potential Hazards and Hazardous Agents	Hazard Elimination, Isolation, or Mitigation
• Site preparation • Groundwater sampling • Groundwater field measurements • Sample preservation • Well surface maintenance/construction • Internal well component maintenance/change-out • Well component decommissioning • Well abandonment • Drilling and well installation	1. Contact or exposure to chemicals at the task site—Direct contact with water sample preservation acids, contact with cement (high pH), bentonite, silica, fuels, lubricants, dust, CO and NO_x, and trace metals/chemicals in groundwater and soil 2. Pinch points, caught-between, struck-by, and overhead hazards—Well component assembly and placement, vehicle or equipment movement, well construction/abandonment, excavation, crane or boom truck use, drill rig operation, and material movement/stacking/handling 3. Lifting and back strain—Moving equipment and materials, sampling coolers, pumps, well components, and generators 4. Tripping hazards, uneven terrain, walking, and working surfaces—Uneven surfaces; wet, muddy, or snow- or ice-covered surfaces; and cables, cords, and lines on the ground 5. Hoisting and rigging—Pulling/positioning pumps and equipment at project site 6. Heated surfaces, heat, and cold stress—Generator motor and exhaust surfaces, outdoor work, summer and fall temperatures, and PPE use 7. Hazardous noise levels—Trucks, heavy equipment, compressors, and hand tools 8. Energy sources—Elevated materials/components and 110-VAC electrical, mechanical, thermal, and compressed air systems 9. Snakes/animals/ticks/spiders/Hantavirus—Material storage areas, inside well casing/under well access lids, under well surface completion cement pads, or other areas where small animals might hide	1. DWA or CWA; MSDS for all chemicals used; PPE to avoid skin contact; acid use in laboratory hood; CO and NO_x monitoring; industrial hygiene monitoring, trained fuel handlers; HASP training; and PPE (as required) 2. Qualified operators; spotters; backup alarms; DWAs; CWAs; established truck and traffic lanes (as required); body position awareness; hand, head, body protection; tag lines for hoisting and rigging; and work controls 3. Mechanical lifting and movement devices; proper lifting techniques; lifting no more than 50 lb or 1/3 of body weight; and storing materials in racks and at waist or chest height (where possible) 4. CWA; DWA; identify and mitigate tripping hazards and mark where possible; keep walking and working surfaces clean (where feasible); and foot-protection entry 5. CWA; qualified operators; certified rigging; PRD-600 requirements; tag lines; and wind restrictions 6. CWA; DWA; restricted areas; identify known heated surfaces where contact is possible; industrial hygiene monitoring and work/rest or warm-up cycles (as required) for heat and cold stress; proper selection of work clothing or PPE; and personnel training 7. CWA; DWA; industrial hygiene sound-level monitoring and dosimetry for source identification; and hearing-protection devices 8. CWA and restricted areas; posted and labeled sources; hoisting and rigging standard. Practices (as stated above) training; energy source isolation (lockout/tagout) for all maintenance, decommissioning, and abandonment activities; outage or subsurface investigation (as required); and PPE 9. Use caution when lifting well access lid; watch ground surface for pests; do not disturb rodent nesting areas; and use leather boots, full-length clothing, and gloves.

CWA = controlled work area
DWA = designated work area
HASP = health and safety plan
MSDS = material safety data sheet
PPE = personal protective equipment
PRD = program requirements document

Table 8-3. Groundwater-monitoring project hazards to be monitored.

Tasks	Hazards to be Monitored[a]
• Site preparation • Groundwater and lysimeter sampling • Groundwater field measurements • Sample preservation • Well surface maintenance/construction • Internal well component maintenance/change-out • Well component decommissioning • Well abandonment • Drilling and well construction/installation	CO and NO_x—operations with generators or equipment in areas with poor air movement Nuisance dust (inhalable/respirable)—well surface construction, decommissioning, and abandonment tasks (use of bentonite and excavation tasks) Crystalline silica dust (respirable)—drilling and well construction/installation, well surface construction and abandonment (use of cement) Hazardous noise levels[b]—trucks, heavy equipment, drill rig, compressors, generator, and other equipment, as deemed appropriate Organic compounds—contaminants (as listed on Table 8-1), fueling operations, and general operations with potential for exposure to organic hydrocarbons, as deemed appropriate Diesel exhaust—in areas with poor ventilation only.

a. Monitoring and sampling will be conducted (as deemed appropriate by project Industrial Hygiene personnel) based on specific tasks, site conditions, and professional judgment.

b. Sound-level meter will be used for instantaneous sound levels and to determine hearing protection requirements. Additional noise dosimetry may be conducted, as deemed appropriate, based on the nature of the sound-level sources and duration of exposure or project.

Table 8-4. Equipment available for monitoring groundwater-monitoring project hazards.

Chemical or Radiological Hazard to be Monitored or Sampled	Equipment and Monitoring and Sampling Method [a]	
Petroleum hydrocarbons, VOCs Nuisance particulates, NOC (inhalable/respirable) Crystalline silica (respirable) Diesel exhaust	Personal sampling pumps with appropriate media. Passive samplers for organic vapors. Industrial hygienist will determine appropriate NIOSH, OSHA, or other established sampling method.	
Petroleum hydrocarbons, VOCs	FID, PID, or equivalent	
CO, NO_2	Direct-reading instrument with CO and/or NO_2 cells	
Radionuclides	TLD, electronic dosimetry in accordance with the RWP. Personnel contamination monitoring and hand-held instruments or portable air monitors.	
Hazardous noise levels (>85 dBA for an 8-hr workday, 84 dBA for a 10-hr day, >140-dBA impact)	ANSI Type S2A sound-level meter and ANSI S1.25-1991 dosimeter (A-weighted scale for TWA dosimetry, C-weighted scale for impact-dominant sound environments)	
Heat and cold stress	Heat stress—WBGT, body weight, fluid intake	Cold stress—ambient air temperature, wind chill charts

a. Air sampling will be conducted as deemed appropriate by project Industrial Hygiene personnel based on initial direct-reading instrument data, groundwater-monitoring operation, and professional judgment.

ANSI = American National Standards Institute
CO = carbon monoxide
dBA = decibel A-weighted
FID = flame ionization detector
NIOSH = National Institute of Occupational Safety and Health
NOC = not otherwise classified
NO_2 = nitrogen dioxide
OSHA = Occupational Safety and Health Administration
PID = photoionization detector
RWP = radiological work permit
TLD = thermoluminescent dosimeter
TWA = time-weighted average
VOC = volatile organic compound
WBGT = wet bulb globe temperature

Table 8-5. Action levels and associated responses for groundwater-monitoring project hazards.

Contaminant or Agent Monitored	Action Level	Response Taken if Action Level is Exceeded
Nuisance particulates (NOC)	>10 mg/m^3 (inhalable fraction) >3 mg/m^3 (respirable fraction)	1. Move personnel to upwind position of source. 2. Use wetting or misting methods to minimize dust and particulate matter. 3. IF wetting or misting methods prove ineffective, THEN abandon area being worked OR don respiratory protection[a] (as directed by the industrial hygienist).
VOCs, including petroleum hydrocarbons	None detected	No actions are required.
	Detectable but <half the PEL or TLV (whichever is lower) as listed in Table 8-1. (*Note: If more than one VOC is expected, use the most conservative action level.*)	Move personnel to upwind side of source. Continue working, continuously monitoring.
	>Half the PEL/TLV but < the PEL/TLV	**Evacuate area:** If episodic: Leave area until vapor dissipates. Monitor continuously or don minimum Level C respiratory protection[a] and continue working. If sustained: Don minimum Level C respiratory protection,[a] and continue working with periodic monitoring (minimum every 5 minutes).
	>or = PEL/TLV	**Evacuate area**: If episodic: Don minimum Level C respiratory protection,[a] and continue working with periodic monitoring (minimum every 5 minutes). If sustained: Consult health and safety officer and field team leader to determine course of action.
Crystalline silica (respirable)	>0.05 mg/m^3	Move personnel to upwind position of source. Use wetting or misting methods to minimize dust and particulate matter. IF wetting or misting methods prove ineffective, THEN abandon area being worked OR don respiratory protection[a] (as directed by the industrial hygienist).
CO (in poorly ventilated areas)	15 to 25 ppm in workers' breathing zone	Reposition source, monitor near suspected source for elevated levels, ensure personnel are on upwind side of source, and continue to monitor.
	>25 ppm sustained for 2 minutes in workers' breathing zone	Identify source, and leave area until level dissipates below 25 ppm. Then monitor continuously. IF levels cannot be kept below 25 ppm, THEN cease operations and contact maintenance personnel to inspect equipment source.[b]

Table 8-5. (continued).

Contaminant or Agent Monitored	Action Level	Response Taken if Action Level is Exceeded
NO_2 (in poorly ventilated areas)	1 to 3 ppm in workers' breathing zone	Reposition source, monitor near suspected source for elevated levels, ensure personnel are on upwind side of source, and continue to monitor.
	>3 but <5 ppm sustained for 2 minutes in workers' breathing zone	Identify source, and leave area until level dissipates below 3 ppm. Then monitor continuously. IF levels cannot be kept below 3 ppm, THEN reposition source downwind and workers upwind, and contact maintenance personnel to inspect equipment source.[b]
	>5 ppm sustained for 1 minute in workers' breathing zone	Move personnel unwind of source, shut down equipment when safe to do so, and contact maintenance personnel to inspect equipment source.[b,c]
Diesel exhaust (as elemental carbon)	**Note**: Elevated CO and NO_2 concentrations should be used as an indication for elevated diesel exhaust concentrations.	IF elevated CO and NO_2 concentrations are indicated, THEN reposition source, monitor near suspected source for elevated levels, ensure personnel are on upwind side of source, and continue to monitor.
	>0.02 mg/m^3 TWA	Cease operations and contact maintenance personnel to inspect equipment source.[b]
Hazardous noise levels	<85 dBA 8-hr TWA, <84 dBA 10-hr TWA	No action.
	85 to 114 dBA	Hearing protection is required to attenuate to below 85 dBA for an 8-hr TWA or 84 dBA for a 10-hr TWA (based device NRR).
	(a) >115 dBA (b) > 40 dBA	(a) Isolate source and evaluate NRR for single device. Double protection, as needed. (b) Control entry, isolate source. Only approved double protection should be worn.

a. Respiratory protection will be prescribed by the project industrial hygienist (see Section 9).
b. All equipment must be secured and left in a safe configuration before leaving area.
c. At no time will personnel continue to work in areas with sustained concentrations of NO_2 above 5 ppm (Occupational Safety and Health Administration ceiling value).

DBA = decibel A-weighted
NOC = not otherwise classified
NRR = noise reduction rating
PEL = permissible exposure limit
TLV = threshold limit value
TWA = time-weighted average
VOC = volatile organic compound

8.2 Routes of Exposure

Exposure pathways for contaminants that might be encountered during groundwater-monitoring activities are directly related to the source of exposure and associated route(s) of entry. Engineering controls, industrial hygiene monitoring, training, and work controls are all intended to mitigate potential exposures and uptake of contaminants. However, the potential for exposure to contaminants still exists.

Exposure pathways include the following:

- Inhalation of vapors from trace contaminants in water samples or drill cuttings, preservation acid vapors, or nuisance or silica-containing dusts during well construction, decommissioning, or abandonment tasks. Inhalation of these sources could lead to signs or symptoms described in Table 8-1 for the specific hazard.

- Absorption through the skin upon contact with preservation acids, cement, bentonite dust, or fuel contact (during refueling tasks). Fuel can be absorbed through unprotected skin; acids and cement/bentonite have a corrosive effect on skin, eyes, and mucous membranes, resulting in irritation or absorption.

- Ingestion of trace contaminants adsorbed to dust particles or on surfaces, resulting in uptake of contaminants through the gastrointestinal (GI) tract and potentially causing GI irritation (radionuclides) or deposition to target organs.

- Injection by breaking of the skin while handling equipment or materials or by migration through an existing wound, resulting in localized irritation, contamination, uptake of soluble contaminants, and deposition of insoluble contaminants.

Monitoring will be conducted to identify sources of potential exposure by all routes of entry and to implement mitigative measures, including engineering controls, hold points, and PPE use (when warranted).

8.3 Environmental and Personnel Monitoring

The potential for exposure to chemical, radiological, physical, and environmental hazards exists from various sources that might be encountered during groundwater-monitoring tasks. Engineering and administrative controls, worker training, and the use of protective equipment will mitigate most of these hazards. Monitoring with direct-reading instruments will be conducted, where deemed appropriate, to provide Industrial Hygiene personnel with real-time data to assess the effectiveness of these controls. In addition, DWAs and CWAs will be established to limit access to areas near hazards to authorized project personnel only (see Section 7).

8.3.1 Industrial Hygiene Monitoring

Various direct-reading instruments and full-period sampling equipment can be used to determine the presence of chemical and physical agents and to access environmental conditions. The frequency and type of sampling and monitoring will be determined by site conditions, direct-reading instrument results, observation, and professional judgment.

All full- and partial-period airborne contaminant sampling can be conducted, as deemed appropriate by the project IH, based on direct-reading instrument results and site conditions. If conducted, all air sampling will be done using applicable NIOSH or OSHA methods and in compliance with the

INEEL safety and health manuals. Risk to site personnel will be assessed in accordance with MCP-153, "Industrial Hygiene Exposure Assessment."

8.3.2 Industrial Hygiene Instrument and Equipment Calibration

All monitoring instruments will be maintained and calibrated in accordance with the manufacturer's recommendations, existing industrial hygiene protocol, and in compliance with the INEEL safety and health manuals. Direct-reading instruments will be calibrated, at a minimum, before daily use and more frequently if directed by the project IH.

8.3.3 Exposure Action Limits

Action levels have been established to prevent and mitigate personnel exposure to chemical and physical hazards during groundwater-monitoring activities. The project HSO, in conjunction with the IH and safety professional, will evaluate activities each day to identify changes in site-specific conditions. If action levels are reached, personnel will take the appropriate actions, as listed in Table 8-5.

The action levels in Table 8-5 are in place to ensure that the established 8-hr time-weighted average (TWA) occupational exposure limits for these chemical compounds are not exceeded. When the associated responses to action levels are followed, an additional safety factor is invoked to further reduce the likelihood that the TWAs will be exceeded. The ceiling value for NO_2 is different from a TWA in that the ceiling value should not be exceeded even for short periods. Therefore, a sustained concentration of NO_2 above 3 ppm measured in the breathing zone of project personnel warrants the immediate actions listed in Table 8-5.

8.4 Physical and Environmental Hazard Evaluation, Control, and Monitoring

The physical and environmental hazards present at groundwater-monitoring sites and the methods that will be used to monitor and control such hazards are described in this subsection. It is critical that all personnel be aware of and understand the scope of work for each task, associated hazards, the equipment to be used, and the controls that are in place to eliminate or mitigate the hazards.

8.4.1 Physical Hazards

The physical hazards encountered while doing tasks at groundwater-monitoring sites pose the most significant risk to personnel. Section 6 provides general safe-work practices that must be followed at all times. The following subsections describe specific industrial safety hazards and procedures to be followed to eliminate or minimize hazards to project personnel.

8.4.1.1 Back Strain. Movement of loaded sample coolers, well components, field measurement equipment, generators, compressors, and other support equipment could result in a back injury or strain. Manual material handling will be minimized through task design and use of mechanical or hydraulic lifts, whenever possible, and positioning of materials at the best working levels at the well locations. Project personnel must not lift more than 50 lb or 1/3 their body weight, whichever is less. Two-person lifts could be required to move some equipment. The IH will evaluate all tasks involving manual lifting in accordance with MCP-2692, "Ergonomics Program."

8.4.1.2 Powered Equipment and Tools. All power equipment and tools will be properly maintained and used by qualified individuals according to the manufacturer's specifications. All work using powered equipment will be done in accordance with PRD-5101, "Portable Equipment and

Handheld Power Tools." Ground-fault circuit interrupters will be used to protect all power tools and equipment used outdoors.

8.4.1.3 Heavy Equipment and Moving Machinery. The hazards associated with the operation of heavy equipment include injury to personnel, equipment damage, or property damage. All heavy equipment will be operated in the manner in which it was intended and according to the manufacturer's instructions. Only authorized personnel will be allowed near operating heavy equipment, and they should maintain visual communication with the operator. Equipment operators will be qualified to operate the equipment being used. Work site personnel will comply with MCP-2745, "Heavy Industrial Vehicles," and PRD-5123, "Motor Vehicle Safety." Additional safe practices include the following:

- Only qualified operators will operate heavy equipment.
- All heavy equipment will have back-up alarms.
- When warranted, a spotter will be used.
- Personnel must maintain a safe distance from operating equipment and remain alert for equipment movement. Personnel must avoid placing themselves between fixed objects and operating equipment and between equipment pinch points. Personnel must remain outside of the equipment swing and turn radius.
- Walking directly behind or to the side of heavy equipment without the operator's knowledge is prohibited. All precautions will have been taken before moving heavy equipment.
- While operating heavy equipment in the work area, the equipment operator will maintain communication with a designated person responsible for providing direct voice contact or approved standard hand signals. In addition, personnel in the immediate work area will be made aware of the equipment operations.
- When warranted and established, equipment will use established traffic lanes and access ways and will be stored in a manner that does not endanger personnel.
- Heavy equipment operators will observe safe clearance distances with overhead power lines during movement and operation.

8.4.1.4 Hoisting and Rigging. A crane or boom truck and associated rigging will be required to position equipment and pull pumps and likely will be required during decommissioning or abandonment tasks. All hoisting and rigging operations will comply with DOE-STD-1090-2004, "Hoisting and Rigging," and PRD-600, "Maintenance Management Requirements." Some basic requirements include, but are not limited to, the following:

- Under no circumstances will personnel be permitted under any suspended load.
- Tag lines must be used to control the load (unless they create an additional hazard).
- Contact or positioning of a suspended load by hoisting and rigging personnel will be limited to conditions defined in PRD-600.
- The swing radius of the load will be cleared, and only authorized personnel involved with the lift will be allowed in the CWA during hoisting and rigging tasks.

- Crane operators will observe safe clearance distances with overhead power lines during movement and operation.

Depending on the complexity of the lift and determination as to whether it is deemed a critical lift, development of a lifting sketch or similar rigging plan might be required to hoist particular objects or equipment. Where required, the sketch (or rigging plan) will contain a sketch of the object to be lifted, including the lifting points or rigging method, center of gravity, gross weight, and required rigging.

All rigging used will have a current load certification tag (or equivalent), demonstrating operability. All equipment operators will be qualified to operate the specific equipment used. Additionally, for mobile cranes or boom trucks, the operator (or designated person) will visually inspect various components at the end of each work day or before use if the crane has not been in regular service. These components include, but are not limited to, the following:

- All control mechanisms for maladjustment interfering with proper operation
- Crane hooks and latches for deformation, cracks, and wear
- Hydraulic systems for proper oil level
- Lines, tanks, valves, pumps, and other parts of air or hydraulic systems for leakage
- Hoist ropes for kinking, crushing, bird caging, and corrosion
- All anti-two-block, two-block warning, and two-block damage-prevention systems for proper operation.

NOTE: *The operator or other designated person will examine deficiencies and determine whether they constitute a safety hazard. If deficiencies are found, they will be reported to the safety professional; hoisting and rigging operations will not proceed until deficiencies are corrected.*

8.4.1.5 Drilling Hazards. Various types of drilling equipment might be used at the new well-installation locations to core to the required depths. Drilling personnel will be aware of potential drilling equipment hazards and body positioning during all material-handling tasks. Several specific hazards associated with drill rigs are described below.

8.4.1.5.1 Slips—Slips are toothed wedges positioned between the drill pipe and the master bushing or rotary cable to suspend the drill string in the well bore when the hoist does not support it. Most accidents associated with slip operations are related to manual material handling; strained backs and shoulders are common.

8.4.1.5.2 Tongs—Tongs are large, counter-weighted wrenches used to break apart torqued couplings on the drill pipe. Both sets of tongs have safety lines; when breakout force is applied to the tongs, the tongs or the safety lines could break and injure a worker standing near them. Accidents can occur when the driller activates the wrong tong lever and an unsecured tong swings across the rig floor at an uncontrolled velocity. A common accident attributable to tongs can occur when a worker has a hand or finger in the wrong place while attempting to swing and latch the tong onto the drill pipe, resulting in crushing injuries to or amputation of the fingers.

8.4.1.5.3 Elevators—Elevators are a set of clamps affixed to the bails on the swivel below the traveling block. They are clamped to each side of a drill pipe and hold the pipe as it is pulled from the well bore. Accidents and injuries can occur during the latching and unlatching tasks; fingers and hands can be caught and crushed in the elevator latch mechanism. If the pipe is overhead when the latching mechanism fails, the pipe could fall on workers who are on the drill floor.

8.4.1.5.4 Catlines—Catlines are used on drilling rigs to hoist material. Accidents during catline operations could injure the worker doing the rigging and the operator. Minimal control over hoisting materials can cause sudden and erratic load movements, which could result in hand and foot injuries.

8.4.1.5.5 Working Surfaces—The rig floor is the working surface for most tasks performed in well-drilling operations. The surface is often wet from circulating fluid, muddy cuttings, and water used or removed from the borehole during drilling operations. Slippery work surfaces can increase the likelihood of back injuries, overexertion injuries, slips, and falls.

8.4.1.5.6 Material Handling—The most common type of accident that occurs during material handling is when a load is being handled and a finger or toe gets caught between two objects. Rolling stock can shift or fall from a pipe rack or truck bed. Fingers and hands can get caught between sampling barrels, breakout vices, and tools.

8.4.1.5.7 High-Pressure Lines—A high-pressure diversion system will be used to carry cuttings away from the borehole. All high-pressure lines will be equipped with positive-locking connectors (e.g., cams) and secured with whip checks in case a connection fails. The project safety professional will be consulted regarding the number and placement of whip checks or equivalent restraining devices.

8.4.1.6 Electrical Hazards and Energized Systems. Electrical equipment and tools, as well as overhead lines, could pose shock or electrocution hazards. Safety-related work practices, including inspections, will be used to prevent electrical shock or other injuries from direct or indirect electrical contact. If work on energized systems is necessary, these practices will conform to the facility supplemental requirements in PRD-5099, "Electrical Safety"; MCP-3650, "Chapter IX–Level I Lockouts and Tagouts"; or MCP-3651, "Chapter IX–Level II Lockouts and Tagouts"; and Parts I through III of National Fire Protection Association (NFPA) 70E, "Standard for Electrical Safety Requirements for Employee Workplaces."

All electrical work will be reviewed and completed under the appropriate work controls (e.g., work orders, TPRs, or equivalent subcontractor work controls) and will only be performed by qualified personnel. In addition, any generators used at the project sites will be properly wired and grounded in accordance with PRD-5099, "Electrical Safety," and 29 CFR 1926, Subpart K, "Electrical." Electrical power tools, equipment, and cords must be inspected for damage before use. If damaged, they must be tagged and removed from service.

8.4.1.7 Personal Protective Equipment. Wearing PPE will reduce a worker's ability to move freely, see clearly, and hear directions and noise that might indicate a hazard. The PPE also can increase the risk of heat stress. Work activities at the task site will be modified, as necessary, to ensure that personnel are able to work safely in the required PPE. Work site personnel will comply with PRD-5121, "Personal Protective Equipment." Project PPE levels for groundwater-monitoring activities are described in Section 9 and listed in Table 9-1.

8.4.1.8 Decontamination. Decontamination of drilling and sampling equipment will be required. Section 10 describes decontamination techniques in detail. Personnel will do decontamination tasks in accordance with applicable TPRs or MCPs and wear the prescribed PPE. The FTL will direct all equipment decontamination tasks to ensure their effectiveness.

8.4.1.9 Flammable and Combustible Hazards. Flammable or combustible liquid fuel will be used in equipment at the task sites. Diesel fuel used at the task site will be safely stored, handled, and used. Portable motorized equipment (e.g., generators and light plants) will be shut off and allowed to cool in accordance with the manufacturer's operating instructions before refueling to minimize the potential for a fuel fire.

Only flammable liquid containers approved by Factory Mutual/Underwriter's Laboratory and labeled with the contents will be used to store fuel. All fuel containers will be stored at least 15 m (50 ft) from any facilities (e.g., trailers) and ignition sources or will be stored inside an approved flammable storage cabinet. Additional requirements are provided in PRD-308, "Handling and Use of Flammable and Combustible Liquids." Portable fire extinguishers, with a minimum rating of 10A/60BC, will be strategically located at the site to combat Class A, B, and C fires.

Accumulation of combustible materials will be strictly controlled at groundwater-monitoring sites. Disposal of combustible materials will be assessed at the end of each shift. Class A combustibles (e.g., trash, cardboard, rags, wood, and plastic) will be properly disposed of in approved containers.

8.4.1.10 Project Equipment Fire Hazards. Combustible or ignitable materials in contact with or near exhaust manifolds, catalytic converters, or other ignition sources could result in a fire. The INEEL Fire Department might have to authorize any hot work to be done if the fire danger at the INEEL is deemed high or extreme. The project safety professional will be contacted to initiate a hot work permit. If a hot work permit is issued, a trained fire watch will be assigned. Fire extinguishers will be positioned in the DWA or CWA on or near site equipment that has exhaust heat sources and all equipment capable of generating ignition (or that has the potential to spark). At least one radio or cell phone will be required when conducting groundwater-monitoring tasks so emergency communications can be established if the INEEL Fire Department or nearest incident response team needs to be summoned. Section 11 details emergency communications.

8.4.2 Environmental Hazards

Environmental hazards will be encountered during groundwater-monitoring activities based on the nature of the work (outside), locations of the wells, and time of year when these tasks will be conducted (year-round). The following subsections provide guidelines for mitigating environmental hazards.

8.4.2.1 Heat Stress. Summer temperatures and the use of PPE that prevents the body from cooling could lead to heat stress. High ambient air temperatures can cause increased body temperature, heat fatigue, heat exhaustion, or heat stroke, producing effects that include physical discomfort, unconsciousness, and even death. Personnel must inform the FTL or HSO when experiencing any signs or symptoms of heat stress or observing a fellow worker experiencing them. Heat stress hazards are further described in Table 8-6 and in MCP-2704, "Heat and Cold Stress."

Monitoring for heat stress conditions will be done in accordance with the requirements of MCP-2704, "Heat and Cold Stress." The IH will inform the FTL and HSO of necessary adjustments to the work/rest cycle, depending on the ambient weather conditions, work conditions, type of PPE worn, and the physical response of work operations personnel. In addition, physiological monitoring may be conducted to determine if personnel are replenishing liquids fast enough. A supply of cool drinking water

will be provided and consumed only in approved areas. As appropriate, the IH or HSO will interview workers periodically to ensure that the controls are effective and that excessive heat exposure is not occurring. Workers will be encouraged to monitor their body signs and take breaks if symptoms of heat stress occur.

Table 8-6. Heat stress signs and symptoms.

Heat-Related Illness	Signs and Symptoms	Emergency Care
Heat rash	Red skin rash and reduced sweating	Keep the skin clean, change all clothing daily, and cover affected areas with powder that contains cornstarch or with plain cornstarch.
Heat cramps	Severe muscle cramps, exhaustion, sometimes with dizziness or periods of faintness	Move the patient to a nearby cool place, and give the patient half-strength electrolytic fluids. If cramps persist, or if signs that are more serious develop, seek medical attention.
Heat exhaustion	Rapid, shallow breathing; weak pulse; cold, clammy skin; heavy perspiration; total body weakness; dizziness that sometimes leads to unconsciousness	Move the patient to a nearby cool place. Keep the patient at rest, give half-strength electrolytic fluids, treat for shock, and seek medical attention. DO NOT TRY TO ADMINISTER FLUIDS TO AN UNCONSCIOUS PATIENT.
Heat stroke	Deep, then shallow breathing; rapid, strong pulse and then rapid, weak pulse; dry, hot skin; dilated pupils; loss of consciousness (possible coma); seizures or muscular twitching	Cool the patient rapidly. Treat for shock. If cold packs or ice bags are available, wrap them and place one bag or pack under each armpit, behind each knee, in the groin, on each wrist and ankle, and on each side of the neck. Seek medical attention as rapidly as possible. Monitor the patient's vital signs constantly. DO NOT ADMINISTER FLUIDS OF ANY KIND.

NOTE: *Heat exhaustion and heat stroke are extremely serious conditions that can result in death and should be treated as such. Immediately transport the patient to the nearest medical facility.*

Individuals showing any of the symptoms of heat exhaustion listed in Table 8-6 will (1) stop work, (2) exit the work area, (3) be decontaminated (as appropriate), (4) remove protective clothing (as applicable), (5) move to sheltered area to rest, (6) be provided with cool drinking water, and (7) be monitored by a medic or cardiopulmonary resuscitation (CPR)/first-aid certified employee.

8.4.2.2 Low Temperatures. Exposure to low temperatures will be a factor during groundwater-monitoring activities. Winter conditions, relatively cool ambient temperatures, and wet or windy conditions increase the potential for cold injury to personnel. The project IH and HSO will be responsible for obtaining meteorological information to determine if additional cold-stress administrative controls are required. The hazards and monitoring of cold stress are discussed in MCP-2704. Additional cold weather hazards from working on snow- or ice-covered surfaces exist during fall and winter months. Slip, fall, and material-handling hazards increase under these conditions. Every effort must be made to ensure that walking surfaces are kept clear of ice. The FTL or HSO should be notified immediately if slip or fall hazards are noted at groundwater-monitoring sites.

8.4.2.3 Inclement Weather Conditions. Groundwater-monitoring activities take place outdoors year-round, and inclement weather is to be expected. Inclement or adverse weather conditions (e.g., sustained strong winds 25 mph or greater, electrical storms, winter storms, heavy precipitation, wildfire, icy or muddy roads, blowing dust, and limited visibility due to fog or dusty conditions) could pose a threat to personnel conducting groundwater-monitoring tasks. The FTL will be responsible for checking weather reports and communicating this information to field team members. The FTL, in consultation with the HSO, will evaluate changing weather conditions and determine if environmental conditions pose unacceptable hazards to personnel or equipment. If required based on changing inclement weather conditions, the FTL will direct field personnel to secure equipment in a safe configuration and seek shelter (commensurate with the weather conditions).

NOTE: *Wind restrictions governing hoisting and rigging activities are provided in PRD-600, "Maintenance Management Requirements."*

8.4.2.4 Noise. Personnel working at the task site may be exposed to noise levels that exceed 85 decibel A-weighted (dBA) for an 8-hr TWA and 84 dBA for a 10-hr TWA from various pieces of equipment in use. The effects of high sound levels (i.e., noise) include the following:

- Personnel being startled, distracted, or fatigued
- Physical damage to the ear, pain, and temporary or permanent hearing loss
- Interference with communication that would warn of danger.

The IH will measure noise using the instruments listed in Table 8-4 in accordance with MCP-2719, "Controlling and Monitoring Exposure to Noise," to determine if personnel are exposed to noise above allowable levels. A threshold limit value (TLV) of 85 dBA TWA will be applied to personnel exposed to noise levels over no more than an 8-hr day. This level is based on a 16-hr recovery period in a low-noise environment. If personnel are required to work longer than 8 hours in a hazardous noise environment, then the TLV will be adjusted to a lower value. The project IH must be consulted about modifications to the 85 dBA for an 8-hr TLV and 84 dBA for a 10-hr TWA value.

Personnel whose noise exposure routinely meets or exceeds the allowable level will be enrolled in the INEEL OMP or appropriate subcontractor hearing conservation program. Personnel working on jobs that have noise exposures greater than 85 dBA (84 dBA for a 10-hr TWA) will be required to wear hearing protection until noise levels have been evaluated, and such personnel will continue to wear the hearing protection, as specified by the IH, until directed otherwise.

8.4.2.5 Biological Hazards. Groundwater-monitoring sites are located in areas that provide habitat for various rodents, insects, and reptiles. Based on biological studies at the INEEL, indigenous deer mice have been known to carry the Hantavirus. The Hantavirus could be present in the nesting and fecal matter of deer mice. During the course of mobilization and intrusive activities, the potential exists for project personnel to disturb nesting or fecal matter; this potential also exists during material-handling tasks in the weather structure. If such materials are disturbed, they can become airborne, allowing the virus to be inhaled. In addition, contact with and improper removal of these materials could provide additional inhalation exposure risks.

If suspect rodent nesting or excrement material is encountered, the project IH will be notified immediately and no attempt will be made to remove or clean the area. After an evaluation of the area, the IH will provide guidance for protective equipment, mixing and application of the disinfecting bleach solution, and the method of waste disposal (see MCP-2750, "Preventing Hantavirus Infection").

Snakes, spiders, ticks, and insects also could be encountered. Common areas to avoid include material stacking and staging areas, under existing structures (e.g., well surface completion cement pads), under boxes, and other areas that provide shelter for snakes and spiders. Protective clothing will prevent personnel from direct contact with insects. However, repellant could be required during Level D activities.

8.4.2.6 Walking and Working Surfaces. Slip, trip, and fall hazards exist from uneven terrain, protruding rocks, holes, well surface completion configurations, and environmental conditions leading to muddy or wet surfaces and snow- and ice-covered walking surfaces. Slippery work surfaces can increase the likelihood of back injuries, overexertion injuries, slips, and falls. When such hazards are identified or anticipated, personnel will be informed of existing tripping hazards during the prejob briefing, and steps will be taken to eliminate or minimize slip hazards. Snow- or ice-covered walking surfaces that present a hazard during groundwater-monitoring tasks will be cleared, or a combination of sand and salt will be applied. In addition, personnel will wear appropriate shoes for the conditions anticipated.

8.4.2.7 Excavation, Surface Penetrations, and Outages. Excavation and surface-penetration tasks could be required in conjunction with well construction, decommissioning, or abandonment. Underground utilities will be identified during a subsurface investigation in accordance with PRD-22, "Excavation and Surface Penetration." A competent person (see definition below) will be designated for all excavation tasks.

In accordance with 29 CFR 1926.32(f), "Competent Person," a competent person for excavation activities is "one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions *[sic]* which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them."

The competent person will evaluate the excavation process to ensure that the proper slope and access requirements are being met; the competent person also will conduct inspections, as required by PRD-22. This inspection must include (at a minimum) signs of possible cave-in, accumulation of water, failure of any protective system component, stability of spoil piles and adjacent structures, and hazardous atmospheres.

Access to any excavation will be limited to authorized personnel only and will be granted only after the competent person has inspected the excavation. If the excavation is adjacent to a roadway, then barricades will be used to prevent vehicles from entering the area around the excavation.

8.4.3 Confined Spaces

Groundwater-monitoring tasks are not anticipated to require entry into confined spaces. However, if a suspected confined space is encountered and not properly posted, it will be treated as a permit-required confined space until an assigned safety professional or IH (see MCP-2749, "Confined Spaces") makes a determination.

8.5 Other Site Hazards and Inspections

Task site personnel should continually be alert for hazards and immediately inform the FTL or HSO if a hazards is identified so that corrective actions can be taken to eliminate or mitigate it. The HSO and FTL will visually inspect the site to ensure that barriers and signs are being maintained, unsafe conditions are corrected, and debris is not accumulating on the site. These inspections will be conducted in addition to regulatory-mandated inspections (as applicable).

The FTL (or designee) will perform periodic safety inspections, using an appropriate checklist, in accordance with MCP-3449, "Safety and Health Inspections." In addition, targeted or required self-assessments might be done in accordance with MCP-8, "Performing Management Assessments and Management Reviews." All inspections and assessments will be noted in the FTL logbook. Health and safety professionals at the task site can, at any time, recommend changes in work habits to the FTL. However, all changes that could affect the project's written work control documents (i.e., HASP, JSAs, and RWPs) must have concurrence from the appropriate project technical discipline representative onsite and have a Document Action Request (DAR) (Form 412.11) prepared if required.

9. PERSONAL PROTECTIVE EQUIPMENT

Industrial safety hazards are the primary hazards associated with groundwater-monitoring tasks. Anyone who enters DWAs or CWAs must wear (as a minimum) Level D PPE. At BIC work sites, this consists of (as a minimum) a hard hat, safety glasses with side shields, and sturdy leather ankle-high shoes. Based on the sampling data available to date, groundwater chemical and radiological contaminants of concern present a minimal exposure potential to project personnel. This section addresses the PPE required for groundwater-monitoring tasks and contingencies for upgrading PPE.

The purpose of PPE is to shield or isolate personnel from chemical, radiological, and physical hazards that cannot be eliminated through engineering or other controls. It is important to realize that no PPE ensemble can protect against all hazards under all conditions; however, work practices and adequate training will provide a greater level of worker protection.

Selection of the proper PPE to protect project site personnel is based on the following:

- Groundwater-monitoring project tasks to be conducted (e.g., well construction/installation, sampling, field measurements, maintenance, decommissioning, and abandonment)
- Expected chemicals and radionuclides that might be encountered
- Potential contaminant routes of entry
- Physical form and chemical characteristics of contaminants
- Acute and chronic effects from exposure to chemicals and radionuclides
- Local and systemic toxicity
- Anticipated exposure levels (e.g., contact and airborne)
- Hazard analysis (see Section 8).

Generally, PPE is divided into two broad categories: (1) respiratory protective equipment and (2) personal protective clothing. Both of these categories are incorporated into the standard four levels of protection (Levels A, B, C, and D). Table 9-1 provides guidance in the selection process for respiratory and protective clothing. Each of the major groundwater-monitoring tasks has been evaluated based on the site-specific hazards, and the most appropriate PPE level (including modifications) has been determined. Task-based respiratory protection and the protective clothing required for groundwater-monitoring tasks are listed in Table 9-1.

9.1 Respiratory Protection

Respiratory protection is not anticipated to be required for groundwater-monitoring tasks, based on the tasks to be completed, quantity and form of potential hazardous constituents, and engineering controls that will be implemented. Therefore, respiratory protection will be made available only as a contingency if action limits are exceeded or site conditions change such that additional respiratory protection is required (i.e., upgraded). Assigned protection factors for respiratory devices will not be exceeded if respiratory protection is required.

Table 9-1. Groundwater-monitoring project task-based personal protective equipment requirements and modifications.

Groundwater-Monitoring Activities	Level of Personal Protective Equipment	Primary or Contingency	Modifications and Comments
• Site preparation • Groundwater and lysimeter sampling • Groundwater field measurements • Sample preservation • Well surface maintenance and construction • Internal well component maintenance/ change-out • Well component decommissioning • Well abandonment • Drilling and well construction	Level D	Primary	Level D PPE as defined in Section 9.2. Modification for specific hand protection for material handling and sampling tasks will be outlined in a specific work control document (e.g., JSA).
	Modified Level D	Upgrade contingency	Upgrading to modified Level D (protective clothing, Tyvek coveralls, or equivalent) could be required if action levels are exceeded or contact with cement or bentonite material cannot be avoided (prolonged and extensive skin contact).
	Level C	Upgrade contingency	If airborne contaminants increase to concentrations above established action limits, Level C full-face air-purifying respiratory protection will be worn in conjunction with chemical protective clothing (cartridge to be selected by project IH based on airborne hazard).

IH = industrial hygienist
JSA = job safety analysis
PPE = personal protective equipment

If respiratory protection is required, all personnel who need to wear respirators will complete training and be fit-tested before being assigned a respirator, according to the training and documentation requirements of this HASP. Requirements for respirator use (i.e., emergency use, storage, cleaning, and maintenance), as stated in MCP-2726, "Respiratory Protection," will be followed.

9.2 Personal Protective Equipment Levels

The following subsections provide details about and an explanation of the PPE levels that will be used for groundwater-monitoring activities. These levels can be modified under the direction of the HSO, in consultation with the project IH and safety professional, as appropriate. Modifications to PPE levels are routine during HAZWOPER activities to maximize efficiency and to meet site-specific needs without compromising personnel safety and health.

Table 9-1 lists each task or assignment and the corresponding PPE level, as well as any additional or special items necessary for personal protection at the task site. The HSO, IH, and safety professional will determine appropriate modifications to the PPE levels listed in Table 9-1.

9.2.1 Level D and Modified Level D Personal Protective Equipment

Level D or modified Level D PPE will be the primary PPE level for all groundwater-monitoring tasks. Level D PPE will only be selected as a work uniform and not on a site with respiratory or skin absorption hazards requiring whole body protection. Level D PPE does not provide protection against airborne chemical hazards, but rather is used for protection against nuisance contamination and physical hazards. Level D PPE will only be allowed in areas that have been characterized as having no chemical hazards or are known to have never been contaminated. The IH or RCT can modify the Level D PPE ensemble to provide protection from skin or other physical hazards but will not include the addition of respiratory protection.

Level D PPE consists of the following:

- Coveralls or work clothes (as determined by the IH and safety professional)
- Hard hat
- Eye protection and safety glasses with side shields as a minimum (see PRD-5121, "Personal Protective Equipment")
- Hand protection for all material-handling tasks (e.g., leather gloves for material handling tasks and nitrile or equivalent gloves for sampling and acid-handling tasks, as specified by the IH)
- Safety footwear (steel or protective toe and shank, as determined by the safety professional)
- Optional Level D modifications consisting of the following:
    - Chemical protective clothing (i.e., Tyvek and Saranex), as prescribed by project IH
    - Chemically resistant hand and foot protection (i.e., inner and outer gloves and boot liners)
    - Any specialized protective equipment (i.e., hearing protection, face shields, welding goggles, and aprons)
    - Chemical goggles for cement or bentonite mixing operations. Chemical goggles will be required whenever there is a potential for a chemical splash hazard.

9.2.2 Level C Personal Protective Equipment

Level C PPE will only be worn if the action levels for airborne chemicals (or other constituents) are exceeded and cannot be controlled. In addition, task site chemical contaminants must be well characterized, indicating that (1) personnel are protected from airborne exposures by wearing air-purifying respirators with the appropriate cartridges, (2) no oxygen-deficient environments exist (<19.5% at sea level), and (3) conditions pose no immediate danger to life or health. Basic Level C PPE will include the Level D ensemble with the following respiratory and whole body protection upgrades:

- Full-face, air-purifying respirators equipped with a NIOSH-approved cartridge (the IH will specify the type of cartridge [e.g., organic vapor, high-efficiency particulate air, or combination])
- Chemical-resistant coveralls (i.e., Tyvek QC, Tychem 7500, and Saranex-23-P), as prescribed by project IH
- Chemical-resistant outer shoe or boot cover (the IH will specify the material)
- Inner chemical-resistant nitrile rubber gloves with cotton liners (as determined by the IH)
- Outer chemical-resistant Viton or polyvinyl alcohol gloves (as determined by the IH)
- Optional Level C modifications (any specialized protective equipment [i.e., hearing protection, welding lens, and aprons]).

9.3 Protective Clothing Upgrading and Downgrading

The project HSO, in consultation with the project IH and safety professional, will be responsible for determining when to upgrade or downgrade PPE requirements. Upgrading or downgrading PPE requirements based on current conditions is normal. If changing conditions are encountered, work control documents (e.g., JSA) might need to be written or updated to reflect these changes. Additional reasons for upgrading or downgrading PPE requirements include the following.

Upgrade criteria or conditions (work will stop immediately if an upgrade in PPE is required):

- Unstable or unpredictable site hazards (chemical or other)
- Contaminants that present difficulty in monitoring or detecting
- Known or suspected presence of skin absorption hazards
- Temporary loss or failure of any engineering controls
- Identified source or potential source of respiratory hazard(s)
- Change in the task procedure that could result in increased contact with contaminants or a change in the requirements for meeting any of the criteria listed above.

Downgrade criteria:

- New monitoring data that show the contaminant levels to be lower than established action limits
- Implementation of new engineering or administrative controls that eliminate or significantly mitigate hazards
- Elimination of skin absorption or contact hazards
- Change in site conditions that results in removal of physical hazards or reduces or isolates them to a controlled area

- Completion of or change in tasks that results in the elimination of key hazards that require higher levels of PPE.

9.4 Inspection of Personal Protective Equipment

All PPE ensemble components must be inspected before use and when in use within groundwater monitoring DWAs or CWAs. Once PPE is donned, self-inspection and the use of the "buddy" system will serve as the principle forms of inspection. If at any time PPE should become damaged or unserviceable, the individual will inform others of the problem and proceed directly to the controlled work area exit point to doff and replace the equipment. In addition, all PPE that becomes grossly contaminated with grout or other material will be cleaned or replaced. Table 9-2 provides an inspection checklist for common PPE items.

Table 9-2. Personal protective equipment inspection checklist.

Personal Protective Equipment Item	Inspection
Gloves	Before use: • Pressurize gloves to check for pinholes. To pressurize, blow in the glove, roll until air is trapped, and inspect. No air should escape. Inspect leather gloves for tears, excessive wear, or deterioration or permeation. While wearing in the DWA or CWA: • Inspect for tears, punctures, and damage. Replace if unserviceable.
Modified Level D and C clothing	Before use: • Visually inspect for imperfect seams, nonuniform coatings, and tears. Hold PPE up to the light, and inspect for pinholes, deterioration, stiffness, and cracks. Check cloth coveralls for tears, rips, and deterioration. While wearing in the DWA or CWA: • Inspect for evidence of chemical attack, such as discoloration, swelling, softening, and material degradation. Inspect for tears, punctures, and zipper or seam damage. Check all taped areas to ensure that they are still intact.
Respirators (if required) (full-face, air-purifying)	Before use: • Check condition of the face piece, head straps, valves, connecting lines, fittings, and all connections for tightness. • Check cartridge to ensure proper type or combination for atmospheric hazards to be encountered. Inspect threads and O-rings for pliability, deterioration, and distortion.

CWA = controlled work area
DWA = designated work area
PPE = personal protective equipment

10. DECONTAMINATION PROCEDURES

No decontamination beyond the normal sampling equipment procedures and typical doffing of protective clothing (if required) is anticipated during groundwater-monitoring activities. Other activities—such as well drilling, abandonment, and maintenance—could require the decontamination of process equipment. If contact with potentially contaminated surfaces cannot be avoided, then additional engineering controls, in combination with PPE upgrades, might be necessary to control the contact hazard. If chemical or radiological contamination is encountered at levels requiring decontamination, however, this section provides guidance on how it will be accomplished.

10.1 Contamination Control and Prevention

Contamination control and prevention procedures will be implemented to minimize personnel contact with contaminated surfaces if they are encountered during groundwater-monitoring activities. The following contamination control and prevention measures will be used if contamination is encountered:

- Identify potential sources of contamination, and design containment, isolation, and engineering controls to eliminate or mitigate any potential for contact with or release of contaminants
- Limit the quantity of personnel, equipment, and materials that enter the contaminated area
- If contamination is found on the outer surfaces of equipment, immediately implement decontamination procedures to prevent the spread of contamination
- Use only the established controlled entry and exit points to and from the contaminated area to minimize the potential for cross-contamination and expedite contamination control surveys
- When possible, wear disposable outer garments and use disposable equipment
- Use hold points within procedures and work orders to monitor for contamination (when anticipated).

10.2 Equipment and Personnel Decontamination

Decontamination procedures for personnel and equipment are not anticipated to be required beyond normal PPE change-out and TPRs for sampling equipment cleaning.

10.2.1 Equipment Decontamination

Decontamination of sampling equipment will be done in accordance with GDE-162, "Decontaminating Sample Equipment." If contact with potentially contaminated surfaces cannot be avoided, then additional engineering controls, in combination with PPE upgrades, might be necessary to control the contact hazard. Equipment will be decontaminated based on the source of contamination.

If radionuclide decontamination operations are required for equipment or areas, they will be done in accordance with Chapter 4 of *Manual 15B–Radiation Protection Procedures.* The HSO and project IH will evaluate nonradionuclide decontamination on a case-by-case basis to determine the most appropriate PPE. (If airborne contaminants might be generated, Level C protective clothing will be used until site monitoring can demonstrate that downgrading is warranted.) Specific personnel and equipment decontamination methods are provided in the following subsections.

10.2.2 Personnel Decontamination

Groundwater-monitoring activities will be conducted in Level D PPE unless upgrading is warranted. Engineering controls, in conjunction with work controls and proper handling of groundwater samples, will serve as the primary means of eliminating the need for personnel decontamination. If modified Level D protective clothing is required, all items will be inspected in accordance with Table 9-2.

10.2.3 Decontamination in Medical Emergencies

First-aid-trained personnel at the project task site will immediately evaluate (on a voluntary basis) an injured or ill person. If the injury or illness is serious, the FTL will contact the appropriate facility personnel or Warning Communications Center (WCC) to summon emergency services (INEEL Fire Department and CFA Medical) to the site.

Medical care for seriously injured or ill personnel will not be delayed for decontamination. In such cases, gross decontamination can be accomplished by removing the injured person's outer protective clothing (if possible) and containing other contaminated areas with a bag, glove, etc. If contaminated PPE cannot be removed without causing further injury (except for the respirator, which must be removed), the individual will be wrapped in plastic, blankets, or available material to help prevent contaminating the ambulance, medical equipment, and medical personnel.

The IH and/or RCT (depending on the type of contamination) must accompany the employee to the medical facility to provide information and decontamination assistance to medical personnel. Then contaminated PPE will be removed at the CFA Medical Facility and carefully handled to prevent the spread of contamination. Chapter 5 of *Manual 15B–Radiation Protection Procedures* and MCP-148, "Personnel Decontamination," contain information on proper handling of radionuclide-contaminated wounds.

10.3 Doffing Personal Protective Equipment and Decontamination

As stated earlier, no personnel decontamination beyond doffing of PPE is anticipated for this project. Careful removal of the outer PPE will be the primary decontamination method.

The specific doffing sequence of modified Level D or C PPE, and the associated decontamination procedure, will be based on the nature of the contamination. A general approach for doffing modified Level D or C PPE is described below. However, no single doffing strategy works for all circumstances. Modifications to this approach are appropriate if site conditions change or at the discretion of the project HSO in consultation with the project IH and RCT.

10.3.1 Modified Level D Personal Protective Equipment Doffing and Decontamination (If Required)

If wearing modified Level D protective clothing (e.g., disposable coveralls) is required, it will be doffed following standard removal techniques (rolling outside surface inward and down); removal of this clothing will constitute the initial decontamination step. All PPE will be placed in the appropriately labeled containers.

10.3.2 Level C Personal Protective Equipment Doffing and Decontamination (If Required)

If respiratory protection is worn in conjunction with protective clothing (e.g., Level C PPE), then the modified Level D sequence will be followed with one additional step—to remove the respirator and place it in a separate container from the discarded protective clothing. Depending on the type of contamination encountered, this step will be followed by a radiological survey or IH evaluation.

10.4 Disposal of Contaminated Personal Protective Equipment and Other Equipment

10.4.1 Storage and Disposal of Investigative-Derived Waste Materials

Waste might include PPE and miscellaneous sampling materials (e.g., paper towels, plastic bags, and gloves). Based on previous sampling, contamination of miscellaneous sampling materials is not anticipated. If contaminated, the waste will be bagged, secured with duct tape, and labeled in accordance with instructions from the RCT. If the waste is also potentially contaminated with nonradiological hazardous material, the FTL will need to determine whether the waste should be labeled and treated as mixed waste or nonradiological hazardous waste. The FTL can contact WGS for questions about waste characterization. The waste must be stored in an approved CERCLA storage area pending laboratory analyses, if necessary. It is expected that the waste will be handled as conditional industrial waste to comply with the waste-disposal and disposition form. Free release surveys of suspected radiologically contaminated waste will be conducted in compliance with MCP-425, "Radiological Release Surveys and the Control and Movement of Contaminated Materials."

Cold (nonradiological) waste is sent to the CFA landfill or another INEEL-designated solid waste landfill. Low-level radioactive waste is stored in an approved area in accordance with ICP-MCP-3475, "Temporary Storage of CERCLA-Generated Waste at the INEEL Site." The waste will be evaluated for additional characterization and managed as low-level waste. Final disposition will be coordinated with WGS.

10.4.2 Site Sanitation and Waste Minimization

Waste materials will not be allowed to accumulate at groundwater-monitoring sites. Appropriately labeled containers for industrial waste and CERCLA waste (as required) will be maintained at the project site. Personnel should make every attempt to minimize waste through the judicious use of consumable materials. All site personnel are expected to make good housekeeping a priority at the job site.

11. EMERGENCY RESPONSE PLAN

This section defines the responsibilities for project personnel and the INEEL Emergency Response Organization (ERO) by providing guidance for responding to abnormal events during project activities.

This emergency response plan addresses OSHA "emergency response" activities, as defined by 29 CFR 1910.120/1926.65, "Hazardous Waste Operations and Emergency Response"; and DOE "emergencies," as defined by DOE Order 151.1B, "Comprehensive Emergency Management System," and DOE Order 231.1, "Environment, Safety, and Health Reporting." This response plan is implemented in concert with PLN-114, "INEEL Emergency Plan/RCRA Contingency Plan."

The "INEEL Emergency Plan/RCRA Contingency Plan" (PLN-114) can be activated in response to events occurring at the INEEL or activated at the discretion of the emergency coordinator (EC)/emergency action manager (EAM). When the INEEL plan is activated, project personnel will follow the direction and guidance communicated by the EC.

NOTE: *The term "emergency" is defined differently by OSHA and DOE. For simplicity, however, the term "emergency" is used in this section of the HASP to refer to events covered by either definition.*

Emergency response plans must be developed and put in place before any project activity begins. Preplanning makes it possible for the project to anticipate and appropriately respond to abnormal events that can affect project activity. Preplanning also ensures that the project emergency response program is integrated with that of the INEEL.

On-scene response to and mitigation of site emergencies could require the expertise of both project personnel and INEEL Fire Department personnel. Emergencies that could occur include the following:

- Accidents resulting in injury
- Fires
- Spills of hazardous or radiological materials
- Tornadoes, earthquakes, and other adverse natural phenomena
- Vehicle or transportation emergencies
- Safeguard and security emergencies
- Emergencies at nearby facilities that could prompt evacuation or take-cover actions at the task site.

11.1 Types of Emergency Events

11.1.1 Events Requiring Emergency Notifications

Certain events require courtesy notifications but no response from the INEEL ERO. In these cases, the project FTL or designee will immediately notify the facility shift supervisor (SS), the site area manager, or the WCC. The FTL's notification should describe the event and state that no emergency response support is required. Examples of these types of events include, but are not limited to, the following:

- Personal injury at the site requiring medical evaluation or first-aid treatment but not requiring an ambulance response

- Equipment or vehicle accident that results in damage to the vehicle or property ONLY

- Small fire that is immediately extinguished with a hand-held fire extinguisher (also requires notification to the INEEL Fire Department)

- Any other event deemed potentially reportable.

NOTE: *In most cases, monitoring sites are located outside a facility fence. Therefore, the CFA site area manager will be the primary contact for most emergency notifications. When an emergency occurs at a monitoring site located inside the fence of a facility, emergency notifications should first be made to the plant SS. The SS will then notify the site area manager or will instruct the FTL or designee to notify the site area manager directly.*

11.1.2 Events Requiring Local Project Evacuation or Idaho National Engineering and Environmental Laboratory Response

Some events that could occur at the project site might require support from the INEEL ERO or might require a local area evacuation of the project site. In these cases, the project FTL will immediately notify the facility SS and/or site area manager. If the facility SS and/or site area manager cannot be contacted immediately, then the WCC will be contacted. The FTL's notification will describe the event and request emergency response resources, as appropriate. After being informed of the event, the facility EC may elect to activate the command post. Once the command post is operational, all emergency response activities will be coordinated through the EC. The specific actions to be taken in response to emergency alarms are described in Section 11.3. Examples of these types of events include, but are not limited to, those listed below:

- Fire that is burning beyond an incipient stage and cannot be extinguished with hand-held extinguishers

- Large spill at the project that cannot be immediately contained or controlled

- Serious injury to a worker or workers.

NOTE: *When the project site has been evacuated, the FTL will serve as the project area warden and ensure that the facility contact or EC (if a command post is formed) is notified that project personnel have been evacuated and accounted for.*

11.1.3 Events Requiring Total Facility and Project Evacuation

In the event of a facility or INEEL site evacuation, the FTL will verbally notify all project personnel to evacuate by using the radio or the local evacuation signal. The notification could be via alarms or other communication (e.g., radio), as initiated by the EC for protective actions. For accountability purposes, the FTL will do a positive sweep of the site before evacuation.

NOTE: *When an evacuation is called for by the EC, the FTL will serve as the project area warden and will ensure that the appropriate facility personnel and EC (if a command post is formed) are notified that project personnel have been evacuated and accounted for.*

11.2 Emergency Facilities and Equipment

Emergency response equipment that will be available at the groundwater-monitoring site includes the items described in Table 11-1. The INEEL Fire Department maintains an emergency hazardous material response van that can be used to respond to an event or emergency at the project site. The INEEL Fire Department personnel also are trained to provide immediate hazardous-material-spill and medical services. At least two people with current medic/first-aid training will be present at the project site to render first aid on a voluntary basis. For serious injury, assistance from the INEEL Fire Department will be summoned. Likewise, the INEEL Fire Department will be summoned when fires cannot be handled with hand-held extinguishers. All fires of any size will be reported promptly to the INEEL Fire Department, even if site personnel have extinguished the fire.

Table 11-1. Emergency response equipment to be maintained at the site during operations.

Equipment Name	Location at Task Site	Responsible Person	Frequency of Inspection or Verification[a]
First-aid kit	Project vehicle or near DWA or CWA	HSO	Monthly—check seal only
Eyewash bottles[b] Eyewash station[b]	In or near DWA or CWA	HSO	Monthly
Hazardous materials spill kit	Project vehicle	HSO	Verification
Extra PPE	Project vehicle or support trailer	HSO	Verification
Communication equipment (operational)	Onsite	FTL	Daily radio check
Fire extinguishers[c]	In or near DWA or CWA	HSO	Monthly

a. Verification that equipment is present at the designated project location—no inspection tag is required.
b. An eyewash bottle will be used to provide an immediate eye flush, if required. The HSO will identify the location of the eyewash station during the prejob briefing.
c. A minimum of one 10A/60BC fire extinguisher. If used, return for servicing and recharging.

CWA = controlled work area
DWA = designated work area
FTL = field team leader
HSO = health and safety officer
PPE = personal protective equipment

11.3 Emergency Communications

In the event of an emergency, the capability to summon INEEL emergency response resources to immediately notify site personnel and inform others of site emergencies is required. Communications equipment at the task site will be a combination of radios, telephones (e.g., mobile, cellular, or facility), and pagers. The following will be used, as necessary, during emergencies:

- To get help from the INEEL Fire Department, site personnel will use radio communications, call 777, or call 526-1515. The INEEL facility telephones are linked to 777. Use *777 on INEEL mobile or cellular telephones, or go through the INEEL WCC at 526-1515.

- Verbal communication, radios, or cell phones will be used to notify site personnel to stop work and take cover or evacuate the site, as applicable.

- For sites that are located in the field (i.e., inside the INEEL boundary but outside of any specific facility boundaries), the POC will be the FTL or HSO. The POC maintains communications with fieldworkers at all times and can notify fieldworkers of facility or Sitewide emergencies that could affect the task site.

- Where applicable, the appropriate facility SS or site area manager will be notified.

- Site personnel will provide the following information (as available) when communicating emergency information to the INEEL site emergency telephone number, the WCC, or the point of contact:

  - The caller's name, title (e.g., FTL or HSO), telephone number, and pager number

  - Exact location of the emergency

  - Nature of the emergency, including time of occurrence, current site conditions, and special hazards in the area

  - Injuries (if any), including numbers of injured, types of injuries, and conditions of injured

  - Emergency response resources required (e.g., fire, hazardous material, and ambulance)

  - Additional information, as requested.

11.4 Emergency Recognition and Prevention

All project personnel should be alert for potential hazardous situations and signs as well as symptoms of chemical exposure or releases. The project-specific training for all project personnel will include proper site access and egress procedures in response to project events and INEEL emergencies. Visitors also will receive this training on a graded approach based on their access requirements. Alarm identification, location and use of communication equipment, location and use of site emergency equipment, and evacuation routes will be covered. Emergency phone numbers and evacuation route maps will be located onsite.

11.5 Emergency Response Roles and Responsibilities

11.5.1 The Idaho National Engineering and Environmental Laboratory Emergency Response Organization

The INEEL ERO structure is based on the Incident Command System (ICS). The ICS is an emergency management system designed for use from the time an incident occurs and is responded to until it is terminated. The ICS consists of procedures for controlling personnel, facilities, equipment, and communications. It allows for activating emergency response resources in a graded approach, depending on the nature and seriousness of the event. The ICS is implemented as a chain of command operating on three basic levels. They consist of the (1) on-scene commander (OSC), (2) Command Post/Emergency Control Center, and (3) INEEL Emergency Operations Center.

The OSC has the tactical and command responsibility for the control of an emergency at the scene. The senior INEEL Fire Department officer responding for the INEEL Fire Department fills the OSC position. If the event is primarily a security incident, the senior responding protective forces officer will assume the duties of the OSC. In some instances, the incident response team leader (IRTL) may function as the OSC until relieved by a higher-tiered authority. The IRTL reports to the OSC, who reports to the EC/EAM. The Incident Response Team acts at the first responder awareness level by providing initial control, personal protective measures, and incident assessment and mitigation as directed by the IRTL.

The project FTL and HSO, as well as a designated replacement, will be trained at the first responder awareness level and will take immediate actions to do the following:

- Understand the potential outcomes associated with an emergency when hazardous substances are present
- Understand what hazardous substances are and the risks associated with them in an incident
- Recognize the presence of hazardous substances in an emergency
- Identify the hazardous substances, if possible
- Perform the roles of a first responder at the awareness level
- Realize and understand the need for additional resources.

The Command Post/Emergency Control Center is the second tier of the emergency response line organization and is headed by the EC/EAM. The EC/EAM is responsible for all emergency response actions within the entire facility, including advising the OSC. The Command Post/Emergency Control Center is activated for actual or potential emergencies or at the direction of the EC/EAM. If the Command Post/Emergency Control Center is activated in response to an event at the project, then the project will send a representative to the Command Post/Emergency Control Center to advise the EC/EAM.

The Emergency Operations Center is the upper tier of the ERO and is headed by the INEEL emergency director. The emergency director is responsible for all emergency response actions at the INEEL, including advising the EC/EAM. Project personnel do not normally provide direct support to the Emergency Operations Center.

11.5.2 Project Personnel Involved in Emergencies

11.5.2.1 Field Team Leader. The FTL (or designated alternate) is responsible for initiating all requests for emergency services (e.g., fire and medical) and for notifying the appropriate facility personnel (SS and/or site area manager) of abnormal events that occur during the project. The FTL will also serve as the area warden (or designate that responsibility to another person trained to be the area warden) and conduct personnel accountability. In addition, the FTL will control the scene until a higher-tiered ICS authority arrives at the scene to take control. When relinquishing this role, the FTL (or designated alternate) will provide all requested information regarding the nature of the event.

11.5.2.2 Project Personnel. Every person at the groundwater-monitoring site has a role to play during a project event or INEEL emergency. Each employee must be aware of potential problems or unexpected hazardous situations and immediately report these situations to the FTL. All personnel are expected to watch out for their fellow workers, report concerns to the FTL, and respond to emergency events as described in this HASP. Roles and responsibilities are further detailed in Table 11-2.

Table 11-2. Responsibilities during an emergency.

Responsible Person	Action Assigned
FTL (or designee)	Contact the INEEL site emergency telephone number or WCC.
FTL (or designee)	Conduct accountability, and report to appropriate facility personnel.
FTL (or trained designee)	Serve as the area warden.
HSO and medic or first-aid-trained personnel	Administer first aid to victims (voluntary basis).
Trained project personnel	Extinguish fires (incipient fires only).
FTL	Contact the facility SS or site area manager.
FTL (or designee)	Report spills to the INEEL Spill Notification Team.
FTL	Report all fires (including those extinguished by project personnel) to the INEEL Fire Department.
FTL or HSO	Report occupational injuries/illnesses to the OMP.
FTL (or designee)	Support the facility command post technical representative, as requested.

FTL = field team leader
HSO = health and safety officer
INEEL = Idaho National Engineering and Environmental Laboratory
OMP = Occupational Medical Program
SS = shift supervisor
WCC = Warning Communications Center

11.6 Emergencies, Recognition of Warnings, and Response

11.6.1 Spills

Equipment refueling tasks, broken hydraulic lines on equipment, and containerization of purge water are examples of scenarios that have a likely potential to result in spills. If the spills are small enough to be safely contained at the task site, task site personnel will control the spill by using spill supplies at the site and will immediately report the incident to the appropriate facility personnel. For large spills, assistance from the INEEL Fire Department will be summoned. All spills will be reported promptly to the INEEL Spill Notification Team at Pager #6400. If any hazardous material is released, task site personnel will comply with the following immediate spill-response actions.

Untrained Initial Responder (or if the material characteristics are unknown):

- Place equipment in a safe configuration
- **Evacuate** and **isolate** the immediate area
- Notify and then **seek help** from and **warn** others in the area
- **Notify** the FTL.

Trained responder, material characteristics are known, no additional PPE is required:

- Place all equipment in a secure configuration
- **Seek help** from and **warn** others in the area
- **Stop** the spill if it can be done without risk (e.g., return the container to upright position, close valve, and shut off power)
- **Provide** pertinent information to the FTL
- **Secure** any release paths only in an emergency.

11.6.2 Alarms

Alarms and signals are used at the project site and INEEL to notify personnel of abnormal conditions that require a specific response. Responses to these alarms are addressed in general employee training. In addition to the alarms previously described, emergency sirens located throughout the INEEL serve as the primary means for signaling emergency TAKE COVER or EVACUATION protective actions. When monitoring sites are located outside facility boundaries, the FTL must ensure the proper individuals are notified in accordance with MCP-2725, "Field Work at the INEEL," to ensure that the field team will be notified of any area emergencies. To signal site personnel of a project-initiated emergency event, a separate set of emergency signals has been established based on horn blasts (e.g., vehicle). These signals are described in Table 11-3.

Table 11-3. Project internal emergency signals.

Horn Blasts	Associated Response
One long blast	Emergency evacuation, evacuate project site immediately. Proceed in an upwind direction to designated assembly area, as specified by the FTL.
Two short blasts	Nonemergency evacuation of immediate work area. Proceed to designated assembly area, as specified by the FTL.
Three long blasts or verbally communicated	All clear, return to project site.

FTL = field team leader

11.6.2.1 Take Cover—Continuous Siren. Radiation or hazardous material releases, weather conditions, or other emergency conditions could require that all personnel take cover in the nearest building. A TAKE COVER protective action could be initiated as part of a broader response to an emergency and precede an evacuation order. The order to TAKE COVER usually is announced by activating the emergency siren. The signal to take cover is a CONTINUOUS SIREN that can be heard throughout the area. Remember, **STEADY = STAY**. However, the order to take cover can also be given by word of mouth, radio, or voice paging system. When ordered to TAKE COVER, project personnel will place the site in a safe condition (as appropriate) and then seek shelter in the nearest building. Vehicles can be used for shelter if no buildings are nearby. Eating, drinking, and smoking are not permitted during take-cover conditions.

11.6.2.2 Total Area Evacuation—Alternating Siren. A total area evacuation is the complete withdrawal of personnel from the INEEL site. The evacuation signal is an ALTERNATING SIREN.

Remember, **ALTERNATE = EVACUATE**. A single long blast of the vehicle horn is the project's alternate emergency evacuation alarm. However, the order to evacuate can also be given by word of mouth, radio, or voice paging system. When ordered to EVACUATE, project personnel will place the site in a safe condition (as appropriate) and then proceed to the assembly area, as directed by the EC. Eating, drinking, and smoking are not permitted during emergency evacuations.

11.6.2.3 Local Area Evacuation—Vehicle Horn Blast. A local area evacuation is the complete withdrawal of personnel from the project site, but it does not require the complete evacuation of the area. A single, long horn blast (vehicle) will be the project's primary emergency evacuation signal (as listed on Table 11-3). However, the order to evacuate can also be given by word of mouth, radio, or voice paging system. When ordered to evacuate the project site, personnel will place the site in a safe condition (as appropriate) and then proceed along the specified evacuation route to the assembly area designated for local area evacuations or as directed by the FTL. Eating, drinking, and smoking are not permitted during emergency evacuations.

11.6.3 Personnel Accountability and Area Warden

Project personnel are required to evacuate the site in response to TAKE COVER, EVACUATION, and local evacuation alarms. In each case, the FTL (or trained designee) will account for the people present on the site at the time the alarm was initiated. The FTL (or trained alternate) serves as the area warden for the project and completes the personnel accountability (following positive sweeps of the project site) based on the attendance log. The results of this accountability will then be communicated to the FTL for reporting to the appropriate facility personnel.

11.6.4 Notifications

The site area manager is responsible for immediately notifying the DOE and local off-Site agencies of all significant abnormal events that occur during the project. This duty is in addition to the notification requirements established in INEEL procedures for events that are categorized as emergencies or unusual occurrences. For this reason, the project will immediately report all abnormal events that occur on the project site to the appropriate facility SS (where available) and the WCC. The WCC will, in turn, notify the appropriate INEEL emergency response resources and other INEEL facilities, as appropriate. The facility SS and the WCC share the responsibility for notifying the EC/EAM and site area manager. Normally, the FTL is responsible for making the event notifications described above. The FTL may make additional notifications at the discretion of project supervision.

NOTE: *Some monitoring well locations lie just outside a facility fence and might be considered to be under that facility's jurisdiction. In these cases, both the facility site area manager and the CFA site area manager might have simultaneous responsibility for the project. When this occurs, a decision will need to be made as to which site area manager will be the primary contact (directly responsible in emergency situations) and which will be the secondary contact (receives emergency notifications as courtesy information only). The primary and secondary jurisdiction determination must be addressed in the prejob briefing and be made known on the respective facilities' PODs.*

The EC/EAM is the single POC between the project and the INEEL ERO and off-Site people or agencies. The EC will make all off-Site notifications and all media requests concerned.

11.6.5 Evacuation Routes and Medical Facilities

Evacuation routes and assembly areas will be determined before beginning work at each monitoring location. The evacuation routes must be discussed with project personnel at each prejob briefing in accordance with MCP-3003, "Performing Pre-Job Briefings and Documenting Feedback." The "INEEL Emergency Plan/RCRA Contingency Plan" (PLN-114) contains maps of facility evacuation routes, which the FTL may use as a reference. If a total area evacuation is ordered, then project personnel will relocate to the determined evacuation assembly area or respond as directed by the EC/EAM. The locations of the CFA Medical Facility and Fire Station, the Idaho Nuclear Technology and Engineering Center Infirmary, the Test Area North Dispensary and Fire Station, and the Test Reactor Area Infirmary are shown in Figures 11-1 through 11-4.

11.7 Reentry and Recovery

11.7.1 Reentry

During an emergency response, reentering the scene of the event is sometimes necessary. Reasons for reentry include the following:

- Searching for and rescuing people
- Responding to medical first-aid needs
- Performing safe shutdown actions
- Mitigating actions
- Evaluating and preparing damage reports
- Surveying radiation or hazardous material.

Reentries will be carefully planned to ensure that personnel are protected from harm and to prevent initiating another emergency event. Reentry planning is undertaken as a graded approach depending on the nature of the initiating event.

11.7.2 Recovery

After the initial corrective actions have been taken and effective control has been established, response efforts will shift toward recovery. Recovery is the process of assessing post-event and post-emergency conditions and developing a plan for returning to pre-event and pre-emergency conditions (when possible) and following the plan to completion. The EC/EAM is responsible for determining when an emergency is sufficiently stable to terminate the emergency and enter the recovery phase. The PM (with concurrence from the SS, site area manager, or facility manager) will appoint the recovery manager.

11.8 Critique of Response and Follow-up

A review and critique will be conducted after all emergency events, drills, and exercises at the INEEL. In some cases, an investigation might be required before commencing recovery actions. For this reason, care should be exercised to preserve evidence when appropriate.

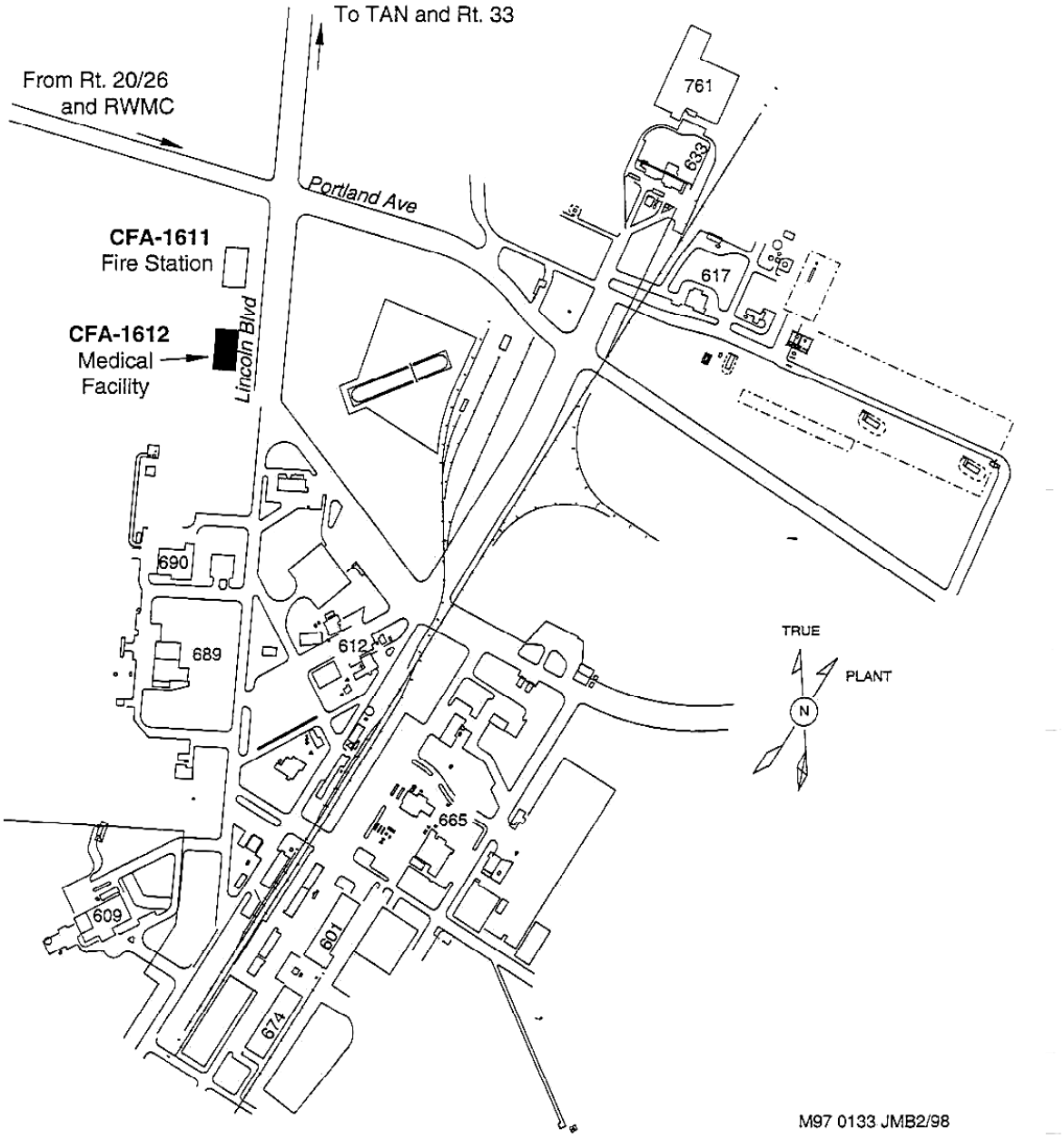

Figure 11-1. Map showing the location of the Central Facilities Area Medical Dispensary (CFA-1612).

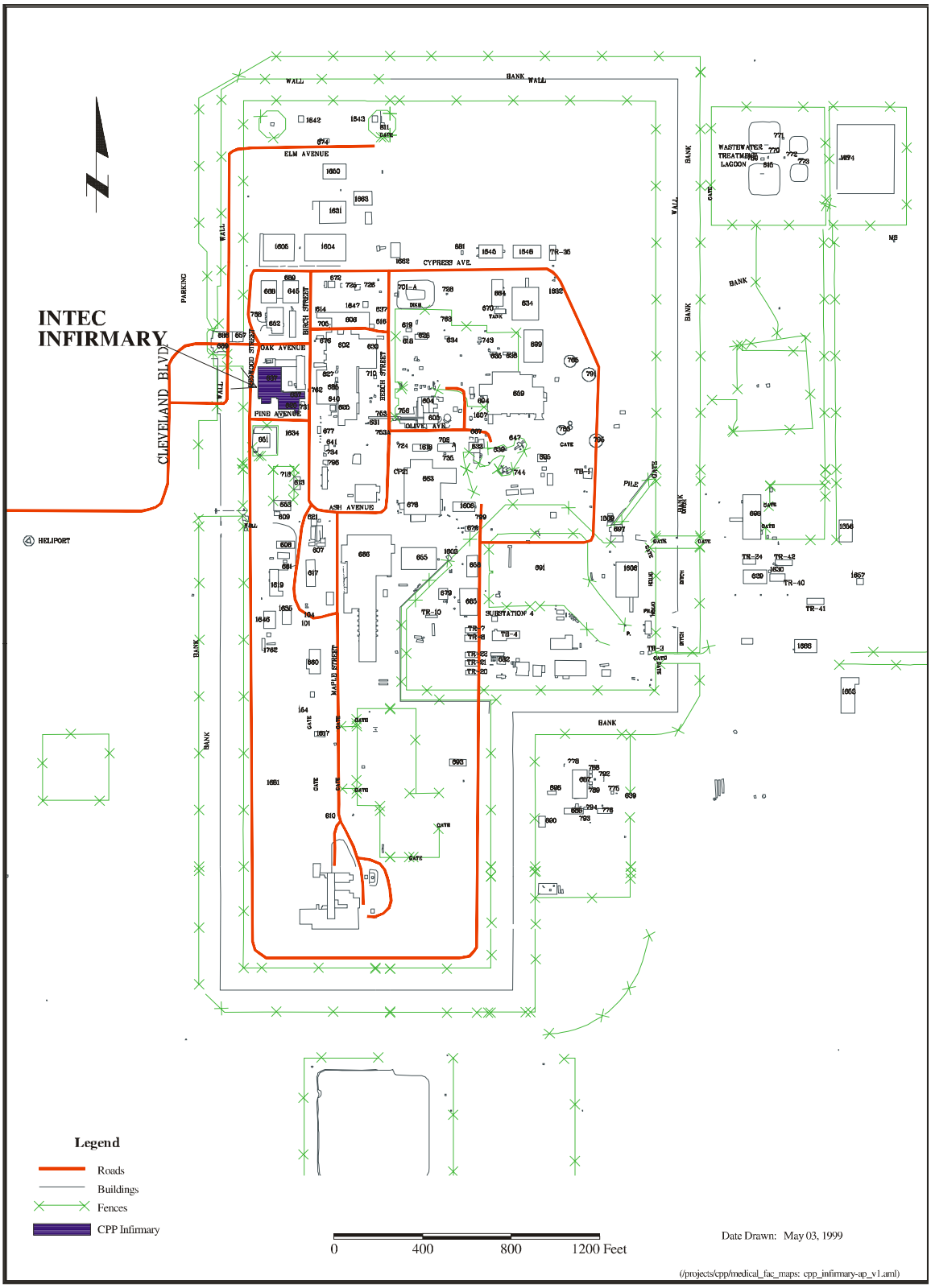

Figure 11-2. Map showing the location of the Idaho Nuclear Technology and Engineering Center Infirmary.

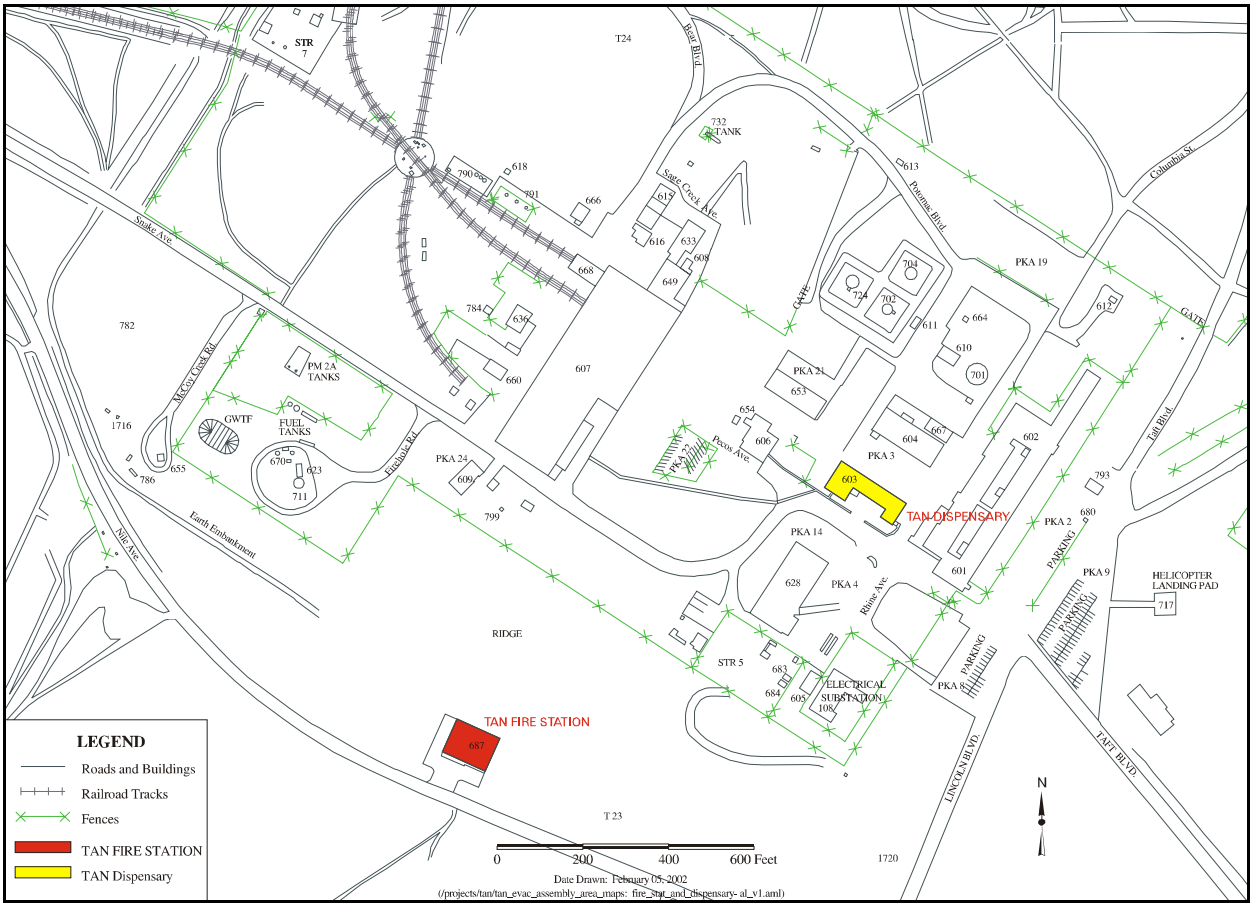

Figure 11-3. Map showing the location of the Test Area North Dispensary and Fire Station.

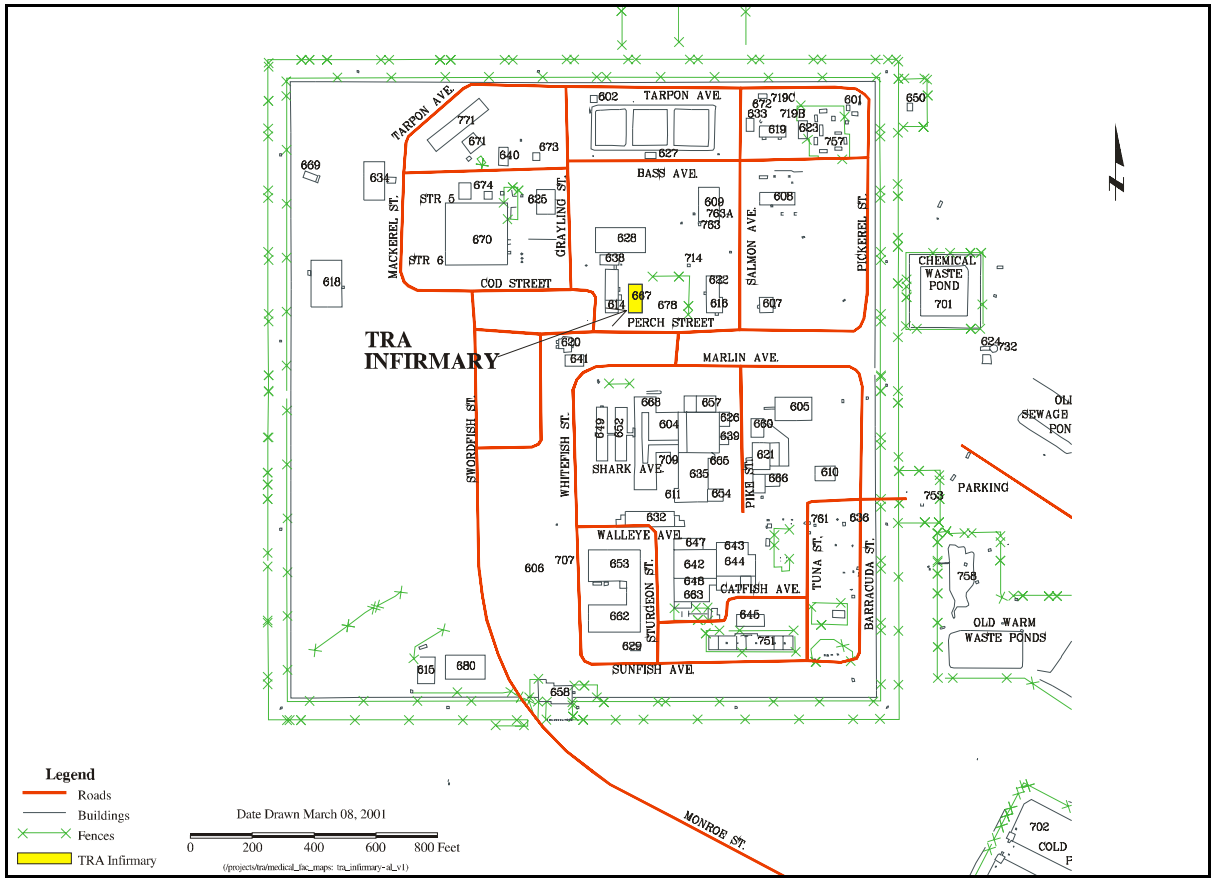

Figure 11-4. Map showing the location of the Test Reactor Area Infirmary.

11.9 Telephone and Radio Contact Reference List

Including a master telephone and radio contact reference list in this HASP is not feasible because of the INEEL sitewide nature of this project. Such a list can be created and updated as needed and made available at the project site. Table 11-4 lists the standard INEEL emergency contact numbers that apply to an INEEL sitewide project. This list will be made available at the project site.

Table 11-4. Emergency contact numbers.

Contact Title	Phone Number/Radio Net
INEEL Emergency Response Telephone Number	777
Warning Communications Center	526-1515, KID-240
First Aid (CFA Medical Dispensary, CFA-1612)	777, 6-2356
Occupational Medical Program	6-1596
Fire/Security	777
Facility Shift Supervisor	TBD*
Facility Management	TBD*
INEEL Spill Notification Team	Pager 6400

* TBD = To be determined by FTL before commencing work at each location
CFA = Central Facilities Area
FTL = field team leader
INEEL = Idaho National Engineering and Environmental Laboratory

12. REFERENCES

29 CFR 1910, 2004, "Occupational Safety and Health Standards," *Code of Federal Regulations*, Office of the Federal Register, September 2004.

29 CFR 1910, Subpart I, 2004, "Personal Protective Equipment," *Code of Federal Regulations*, Office of the Federal Register, September 2004.

29 CFR 1910.120, 2004, "Hazardous Waste Operations and Emergency Response," *Code of Federal Regulations*, Office of the Federal Register, September 2004.

29 CFR 1910.120(e), 2004, "Training," *Code of Federal Regulations*, Office of the Federal Register, September 2004.

29 CFR 1910.120(f)(7), 2004, "Physician's Written Opinion," *Code of Federal Regulations*, Office of the Federal Register, September 2004.

29 CFR 1910.134, 2004, "Respiratory Protection," *Code of Federal Regulations*, Office of the Federal Register, September 2004.

29 CFR 1910.1027, 2004, "Cadmium," *Code of Federal Regulations*, Office of the Federal Register, September 2004.

29 CFR 1926.32(f), 2004, "Competent Person," *Code of Federal Regulations*, Office of the Federal Register, June 2004.

29 CFR 1926.65, 2004, "Hazardous Waste Operations and Emergency Response," *Code of Federal Regulations*, Office of the Federal Register, June 2004.

29 CFR 1926, Subpart K, 2004, "Electrical," *Code of Federal Regulations*, Office of the Federal Register, June 2004.

ACGIH, 2004, *Threshold Limit Values Booklet*, American Conference of Governmental Industrial Hygienists.

ANSI S1.25-1991, 1991, "American National Standard Specification for Personal Noise Dosimeters," American National Standards Institute, January 1991.

DOE O 151.1B, 2003, "Comprehensive Emergency Management System," U.S. Department of Energy, October 2003.

DOE O 231.1A, 2004, "Environment, Safety, and Health Reporting," U.S. Department of Energy, June 2004.

DOE O 5400.5, 1993, "Radiation Protection of the Public and the Environment," Change 2, U.S. Department of Energy, January 1993.

DOE-ID, 1991, *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory,* Administrative Record No. 1088-06-29-120, U.S. Department of Energy Operations Office; U.S. Environmental Protection Agency, Region 10; Idaho Department of Health and Welfare, December 4, 1991.

DOE-ID, 2004, *Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10, and Deactivation, Decontamination, and Decommissioning*, DOE/ID-10587, Rev. 8, U.S. Department of Energy Idaho Operations Office, March 2004.

DOE-STD-1090-2004, 2004, "Hoisting and Rigging," U.S. Department of Energy, June 2004.

Form 361.25, 1999, "Group Read & Sign Training Roster," Rev. 1, Idaho National Engineering and Environmental Laboratory, May 1999.

Form 361.47, 2001, "Hazardous Waste Operations (HazWoper) Supervised Field Experience Verification," Rev. 5, Idaho National Engineering and Environmental Laboratory, July 2001.

Form 412.11, 2004, "Document Management Control System (DMCS) Document Action Request," Rev. 11, Idaho National Engineering and Environmental Laboratory, June 2004.

GDE-162, 2004, "Decontaminating Sample Equipment," Rev. 1, *Environmental Services Project Characterization Sampling Handbook,* April 2004.

ICP-MCP-3475, 2004, "Temporary Storage of CERCLA-Generated Waste at the INEEL Site," Rev. 1, *Manual 8–Environmental Protection and Compliance*, August 2004.

MCP-7, 2004, "Radiological Work Permit," Rev. 19, *Manual 15B–Radiation Protection Procedures*, March 2004.

MCP-8, 2003, "Performing Management Assessments and Management Reviews," Rev. 7, *Manual 13B–Quality and Requirements Management Procedures*, September 2003.

MCP-148, 2004, "Personnel Decontamination," Rev. 5, *Manual 15C–Radiological Control Procedures*, July 2004.

MCP-153, 2002, "Industrial Hygiene Exposure Assessment," Rev. 6, *Manual 14B–Safety and Health–Occupational Medical and Industrial Hygiene*, October 2002.

MCP-188, 2002, "Issuing TLDs and Obtaining Personnel Dose History," Rev. 4, *Manual 15B–Radiation Protection Procedures*, October 2002.

MCP-357, 2003, "Job-Specific Air Sampling/Monitoring," Rev. 11, *Manual 15C–Radiological Control Procedures*, September 2003.

MCP-425, 2003, "Radiological Release Surveys and the Control and Movement of Contaminated Materials," Rev. 6, *Manual 15B–Radiation Protection Procedures*, January 2003.

MCP-553, 2003, "Stop Work Authority," Rev. 7, *Manual 14A–Safety and Health–Occupational Safety and Fire Protection*, April 2003.

MCP-1194, 2003, "Logbook Practices for ER and D&D&D Projects," Rev. 1, *Balance of INEEL Cleanup CERCLA/DD&D Work Processes*, May 2003.

MCP-2381, 2004, "Personnel Exposure Questionnaire," Rev. 5, *Manual 15C–Radiological Control Procedures*, April 2004.

MCP-2559, 2002, "Use of First Aid Kits," Rev. 5, *Manual 14B–Safety and Health–Occupational Medical and Industrial Hygiene*, June 2002.

MCP-2692, 2004, "Ergonomics Program," Rev. 4, *Manual 14B–Safety and Health–Occupational Medical and Industrial Hygiene*, April 2004.

MCP-2704, 2004, "Heat and Cold Stress," Rev. 3, *Manual 14B–Safety and Health–Occupational Medical and Industrial Hygiene*, February 2004.

MCP-2719, 2004, "Controlling and Monitoring Exposure to Noise," Rev. 3, *Manual 14B–Safety and Health–Occupational Medical and Industrial Hygiene*, March 2004.

MCP-2725, 2001, "Field Work at the INEEL," Rev. 3, *Manual 14A–Safety and Health–Occupational Safety and Fire Protection*, January 2001.

MCP-2726, 2003, "Respiratory Protection," Rev. 9, *Manual 14B–Safety and Health–Occupational Medical and Industrial Hygiene*, December 2003.

MCP-2745, 2001, "Heavy Industrial Vehicles," Rev. 1, *Manual 14A–Safety and Health–Occupational Safety and Fire Protection*, December 2001.

MCP-2749, 2002, "Confined Spaces," Rev. 5, *Manual 14B–Safety and Health–Occupational Medical and Industrial Hygiene*, November 2002.

MCP-2750, 2002, "Preventing Hantavirus Infection," Rev. 3, *Manual 14B–Safety and Health–Occupational Medical and Industrial Hygiene*, April 2002.

MCP-3003, 2003, "Performing Pre-Job Briefings and Documenting Feedback," Rev. 11, *Manual 9–Operations*, May 2003.

MCP-3449, 2004, "Safety and Health Inspections," Rev. 4, *Manual 14A–Safety and Health–Occupational Safety and Fire Protection*, September 2004.

MCP-3480, 2004, "Environmental Instructions for Facilities, Processes, Materials, and Equipment," Rev. 9, *Manual 8–Environmental Protection and Compliance*, March 2004.

MCP-3562, 2003, "Hazard Identification Analysis and Control of Operational Activities," Rev. 8, *Manual 9–Operations*, October 2003.

MCP-3650, 2004, "Chapter IX–Level I Lockouts and Tagouts," Rev. 4, *Manual 9–Operations*, April 2004.

MCP-3651, 2004, "Chapter IX–Level II Lockouts and Tagouts," Rev. 5, *Manual 9–Operations*, April 2004.

NFPA 70E, 2004, "Standard for Electrical Safety Requirements for Employee Workplaces," National Fire Protection Association, January 1, 2004.

NIOSH, 1985, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, National Institute of Occupational Safety and Health, Occupational Safety and Health Administration, United States Coast Guard, U.S. Environmental Protection Agency, DHHS (NIOSH) Publication No. 85-115.

PDD-1005, 2004, "INEEL Line Management and Operations Manual," Rev. 8, *Manual 9–Operations*, October 2004.

PLN-114, 2003, "INEEL Emergency Response Plan/RCRA Contingency Plan," Rev. 20, *Manual 16A–Emergency Preparedness Base Plan*, August 2003.

PLN-932, 2004, "Management Plan and Implementation of Best Available Technology per DOE Order 5400.5 for Disposal of Wastewater," Rev. 0, July 2004.

PRD-22, 2004, "Excavation and Surface Penetration," Rev. 5, *Manual 14A–Safety and Health–Occupational Safety and Fire Protection*, August 2004.

PRD-308, 2003, "Handling and Use of Flammable and Combustible Liquids," Rev. 0, *Manual 14A–Safety and Health–Occupational Safety and Fire Protection*, June 2003.

PRD-600, 2003, "Maintenance Management Requirements," Rev. 3, *Manual 6–Maintenance*, March 2003.

PRD-5030, 2004, "Environmental Requirements for Facilities, Processes, Materials, and Equipment," Rev. 3, *Manual 8–Environmental Protection and Compliance*, March 2004.

PRD-5099, 2002, "Electrical Safety," Rev. 3, *Manual 14A–Safety and Health–Occupational Safety and Fire Protection*, September 2002.

PRD-5101, 2001, "Portable Equipment and Handheld Power Tools," Rev. 0, *Manual 14A–Safety and Health–Occupational Safety and Fire Protection*, April 2001.

PRD-5117, 2001, "Accident Prevention Signs, Tags, Barriers, and Color Codes," Rev. 0, *Manual 14A–Safety and Health–Occupational Safety and Fire Protection*, September 2001.

PRD-5121, 2004, "Personal Protective Equipment," Rev. 5, *Manual 14A–Safety and Health–Occupational Safety and Fire Protection*, April 2004.

PRD-5123, 2002, "Motor Vehicle Safety," Rev. 0, *Manual 14A–Safety and Health–Occupational Safety and Fire Protection*, August 2002.

Radiation Protection Department, 2004a, *Manual 15A–Radiological Control Manual*, Rev. 7, February 2004.

Radiation Protection Department, 2004b, *Manual 15B–Radiation Protection Procedures*, TOC-5, Rev. 129, September 2004.

Safety and Fire Protection Department, 2004a, *Manual 14A–Safety and Health–Occupational Safety and Fire Protection*, TOC-48, Rev. 149, September 2004.

Safety and Fire Protection Department, 2004b, *Manual 14B–Safety and Health–Occupational Medical and Industrial Hygiene*, TOC-49, Rev. 79, May 2004.

STD-101, 2004, "Integrated Work Control Process," Rev. 16, *Manual 6–Maintenance*, August 2004.

Training and Qualification Department, 2003, *Manual 12–Training and Qualification*, TOC-11, Rev. 57, June 2004.